Southern California Priority Corridor
Showcase Program Evaluation

TravelTIP Evaluation Report

FINAL
VERSION 1

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Abbreviations & Acronyms

ATIS	Advanced Traveler Information System
ATMS	Advanced Transportation Management System
AVL	Automatic Vehicle Location
Caltrans	California Department of Transportation
CCTV	Closed-circuit Television surveillance camera
CHP	California Highway Patrol
CM	Configuration Management
CMP	Configuration Management Plan
CMS	Changeable Message Sign
CORBA	Common Object Request Broker Architecture
COTS	Commercial Off-the-Shelf
CTC	California Transportation Commission
CVO	Commercial Vehicle Operations
CW	Corridor-wide
CWATIS	Corridor-wide Advanced Traveler Information System Project
CWATMS	Corridor-wide Advanced Transportation Management System Project
CWCVO	Corridor-wide Commercial Vehicle Operations Project
CWSIP	Corridor-wide Systems Integration Project
CWSPP	Corridor-wide Strategic Planning Project
DOIT	Department of Information Technology
DRI	Caltrans, Division of Research & Innovation (formerly NTR)
EAP	Evaluation Activity Plan
EP	Evaluation Plan
FHWA	Federal Highway Administration
FSR	Feasibility Study Report
FTA	Federal Transit Administration
FTE	Full-Time Equivalent (one full-time employee)
GPRA	Government Performance and Results Act
GUI	Graphical User Interface
HAT	Highway Advisory Telephone service
HP	Hewlett-Packard
HQIT	Headquarters - Information Technology (division of Caltrans)
IDL	Interface Definition Language
IPR	Intellectual Property Rights
ISSC	Information Systems Service Center (division of Caltrans)
ISTEA	Intermodal Surface Transportation Efficiency Act (of 1991)
ITS	Intelligent Transportation Systems
LACDPW	Los Angeles County Department of Public Works
LADOT	City of Los Angeles Department of Transportation
LAN	Local Area Network
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MTA	Los Angeles County Metropolitan Transportation Authority

MTBF	Mean Time Between Failure
NDA	Non-Disclosure Agreement
NET	National Engineering Technology Corporation
NTCIP	National Transportation Communications for ITS Protocol
NTR	Caltrans Division of New Technology & Research (now DRI)
OCTA	Orange County Transportation Authority
O&M	Operations and Maintenance
OS	Operating system (such as Windows™, Unix, Linux, et. al.)
PC	Personal Computer (Windows™-based)
RCTC	Riverside County Transportation Commission
RFP	Request for Proposals
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agency
RWS	Remote Workstation
SANBAG	San Bernardino Association of Governments
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCPCSC	Southern California Priority Corridor Steering Committee
SIP	Systems Integration Plan
SOW	Statement of Work
TEA-21	Transportation Equity Act for the 21st Century
TMC	Transportation Management Center
USDOT	United States Department of Transportation
VCTC	Ventura County Transportation Commission
VDS	Vehicle Detector Station
VMT	Vehicle Miles Traveled
VOS	Volume/Occupancy/Speed
WAN	Wide Area Network

Executive Summary

Background

As required by federal law, all Intelligent Transportation System (ITS) projects that receive federal funding must undergo an evaluation to help assess the costs and benefits of ITS. This document is one of 23 reports produced as part of the Southern California ITS Priority Corridor Showcase Program Evaluation to help planners and decision-makers at the federal, state and local levels make better-informed decisions regarding future ITS deployments. This report presents the experiences, costs, and lessons learned from Southern California's TravelTIP project.

In 1993, the U.S. Department of Transportation designated Southern California as one of four Priority Corridors in which ITS could have particular benefit. Southern California suffers from extreme traffic congestion, limited room for expanding transportation facilities, and above-average air pollution levels. The Southern California Priority Corridor is one of the most populated, traveled, and visited regions in the country, and consists of four adjoining regions:

- Los Angeles County and a part of Ventura County
- Orange County
- San Diego County
- Inland Empire (San Bernardino and Riverside Counties).

The ITS Showcase Program is one of several programs that have been implemented in Southern California's Priority Corridor to help aid mobility and mitigate traffic congestion and its associated environmental impacts. The Showcase Program consists of 17 ITS projects that collectively form a corridor-wide intermodal transportation management and information network between Los Angeles, Orange County, San Diego, and the Inland Empire. Each Showcase project deploys a piece of this corridor-wide ITS network, including regional Advanced Traveler Information Systems (ATIS), regional Advanced Transportation Management Systems (ATMS), and regional and interregional communications infrastructure. Eleven of the projects are regional in nature, while the remaining six are corridor-wide. TravelTIP is one of the eleven regional projects within the Southern California Priority Corridor ITS Showcase Program.

Orange County's TravelTIP system provides real-time traveler information regarding traffic congestion and roadway "events" to the general public via the Internet and a Highway Advisory Telephone (HAT) service. Although there are other traveler information systems in the region that provide real-time traveler information for the highways, TravelTIP is unique in that it provides real-time information for both highways and many major arterials as well.

Evaluation Findings, Conclusions, and Recommendations

TravelTIP was designed to provide a unique and ubiquitous traveler information service. It is one of the first traveler information systems to provide traffic conditions on surface streets in addition to highways and freeways, and its geographic coverage includes almost all of Orange County.

Many of the conclusions of this evaluation are limited to general findings because the TravelTIP system has not yet reached full and continuous operation. TravelTIP's implementation was complicated and delayed by the concurrent development of other Showcase infrastructure (namely the Showcase Kernel), as well as interruptions due to facility and legacy system improvements by some of the local partner agencies during the project. Although the system was partially operational while being hosted by its developer, National Engineering Technology (NET), network security settings at the Caltrans District 12 Transportation Management Center (TMC) have been hampering the operation of the TravelTIP Server since roughly March 2002. The evaluation recommends that OCTA consider relocating the TravelTIP servers out of the Caltrans District 12 TMC to a private, third-party service provider that specializes in hosting, operating and maintaining web servers. The TravelTIP system worked well while it was hosted by NET, and the Orange County Model Deployment Initiative (OCMDI) project has also had success using third-party service providers for this purpose.

OCTA covers all of TravelTIP's operations cost on behalf of its partner agencies, which could not otherwise afford to participate. The total annual operating cost for TravelTIP is $72,000-$75,000, with leased telecommunications service being the primary cost contributor. OCTA also budgets an additional $40,000 per year for maintenance labor costs.

Although TravelTIP provides the capability for partner agencies to input textual traffic advisories, most cannot take advantage of this feature due to a lack of human resources. Most local traffic departments are short on staff and cannot spare the time to enter such advisories. Some jurisdictions utilize student interns for this task. The evaluation recommends that other agencies contemplating similar ITS projects should first develop a detailed Concept of Operations (Con Ops) that considers operator workloads and the procedural responsibilities of the individual partners. Development of the ConOps may reveal a requirement that the system be as automated and "hands free" as possible.

Thanks to a strategic marketing campaign in June 2001, TravelTIP received relatively good usage at the beginning. From June 2001 to July 2001, there were an estimated 439 average daily page hits to the TravelTIP website. During August 2001 to January 2002, this number dropped to 191 average daily hits, resulting in an eight-month average of 241 daily hits. The table below compares the average daily use of the TravelTIP website and HAT service to that of Smart Traveler and CHIN, during the eight-month period from June 2001 to January 2002.

System	Average Daily Website Hits (Home Page)	Average Daily Number of Calls
TravelTIP	241	30
SmartTraveler	81	6,250
CHIN	4,029	8,341

CHIN is clearly the most heavily used of the three systems. Possible reasons for the variation in use among the three systems include time-in-market, marketing, system functionalities, and geographic coverage. For example, CHIN and SmartTraveler have been in operation for several years and have statewide coverage, while TravelTIP is new and focuses on the Orange County region.

Greater market penetration is required, however, before TravelTIP should be expected to produce significant transportation system impacts. At its current level of use, TravelTIP reaches roughly 0.01% of Orange County's 2.1 million registered drivers on a daily basis.

When asked what they do with the traveler information, TravelTIP users who responded to the evaluation's online survey reported that they most often take alternate routes (58% of respondents) or change their departure time (46%). This may result in greater vehicle-miles-traveled (VMT) as drivers go out of their way to avoid incidents or plan additional stops and run errands while waiting for congestion to clear. Far fewer respondents reported switching mode to transit (10%) or carpooling (10%).

Lastly, but perhaps more importantly, the development of TravelTIP put in place both a physical and institutional foundation for further ITS development in Orange County. TravelTIP, through its contributions to the Showcase Program's Interface Definition Language (IDL), was instrumental in helping to develop system interface standards for ITS in Southern California. Such standards help promote interoperable systems that enable greater information sharing, improved agency coordination, and reduced costs over time. Furthermore, the deployment of a regional network and several new transportation management centers at local agencies provides a foundation on which functions and services can be tested, analyzed, improved, and added.

TravelTIP also creates an institutional foundation that helps to mainstream ITS in the region. Through the TravelTIP experience, regional partners have had the opportunity to face and resolve critical institutional issues and establish precedents for the region's future ITS projects. These precedents should help clear the way for future ITS advancements in Orange County.

1 Introduction

1.1 Purpose and Scope of this Report

As required by federal law[1], all Intelligent Transportation System (ITS) projects that receive federal funding must undergo an evaluation to help assess the costs and benefits of ITS. The information provided in this report is intended to help planners and decision-makers at the federal, state and local levels make better-informed decisions regarding future ITS deployments based on the experiences of Southern California's TravelTIP project.

This document is one of 23 reports produced as part of the Southern California ITS Priority Corridor Showcase Program Evaluation, and covers only the events and findings resulting from the TravelTIP evaluation. The complete set of findings from the Showcase Program Evaluation are found in the following collection of documents:

Document Type/Title	Date	Document Number
17 Individual Project Evaluation Reports		
Corridor-wide ATIS Project Report (Draft)	6/2/2003	65A0030/0033
Corridor-wide ATMS Project Report	TBD	
Corridor-wide CVO Project Report	TBD	
Corridor-wide Rideshare Project Report	TBD	
Corridor-wide Strategic Planning Project Report	10/29/2002	65A0030/0028
Fontana-Ontario ATMIS Project Report	TBD	
IMAJINE Project Report	3/17/2003	65A0030/0029
IMTMC Project Report	TBD	
InterCAD Project Report	4/2/2003	65A0030/0030
Kernel Project Report	5/30/2003	65A0030/0031
LA ATIS Project Report	TBD	
Mission Valley ATMIS Project Report	TBD	
Mode Shift Project Report	TBD	
OCMDI Project Report	TBD	
Traffic Signal Integration Project Report	TBD	
Transit Mgt System Project Report	TBD	
TravelTIP Project Report (Final)	**2/16/2004**	**65A0030/0036**
5 Cross-Cutting Evaluation Reports		
System Performance Cross-Cutting Report	TBD	
Costs Cross-Cutting Report	TBD	
Institutional Issues Cross-Cutting Report	TBD	
Information Management Cross-Cutting Report	TBD	
Transportation System Impacts Cross-Cutting Report	TBD	
Final Summary Evaluation Report		
Showcase Program Evaluation Summary Report	TBD	

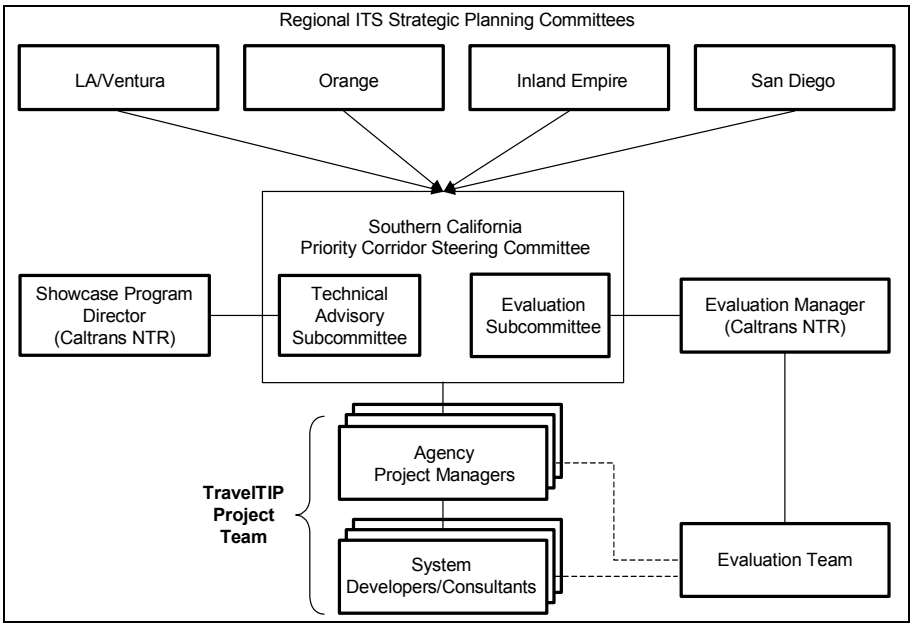
"TBD" indicates a future deliverable that is not yet available.

1.2 Evaluation Design and Approach

The findings outlined in this report are based on over four years of personal observations at project meetings, reviews of released project documents and agency memos, analysis of collected quantitative data, as well as formal and informal interviews and discussions with project partners.

The evaluation is responsive to the needs and suggestions of the Priority Corridor's Evaluation Subcommittee, which reports to the Priority Corridor's Steering Committee. As shown in Exhibit 1, both committees are comprised of stakeholders from the federal, state, and local levels.

Exhibit 1 – Management Structure and Organization of the Showcase Program



The Steering Committee's member agencies reflect wide representation from the region in terms of federal and state highway agencies, public safety, cities and counties, transit, air quality and regional planning entities, including:

- California Highway Patrol (CHP)
- Caltrans, Division of Traffic Operations (headquarters)*
- Caltrans, District 7*
- Caltrans, District 8*
- Caltrans, District 11*
- Caltrans, District 12
- City of Irvine*
- City of Los Angeles Department of Transportation (LADOT)
- City of San Diego
- Federal Highway Administration (FHWA)*

- Federal Transit Administration (FTA)
- Los Angeles County Metropolitan Transportation Authority (LACMTA)
- Orange County Transportation Authority (OCTA)
- Riverside County Transportation Commission (RCTC)
- San Bernardino Association of Governments (SANBAG)
- San Diego Association of Governments (SANDAG)
- South Coast Air Quality Management District (SCAQMD)
- Southern California Association of Governments (SCAG).

* Indicates an Evaluation Subcommittee member

The Showcase Program's Evaluation Design is based on a set of evaluation Goals and supporting Objectives and Measures that were developed by the Evaluation Team in partnership with federal, state and local stakeholders, and documented in the "Showcase Program Evaluation Approach" in 1998. Each individual Showcase project is evaluated based on an applicable subset of these Goals, Objectives, and Measures in order to help ensure that summary evaluation results can be aggregated from across the multiple Showcase project evaluations. The Showcase Program's five evaluation Goals include:

- Evaluate System Performance
- Evaluate Costs
- Evaluate Institutional Issues and Impacts
- Evaluate the Use and Management of Transportation/Traveler Information
- Evaluate Transportation System Impacts.

As TravelTIP evolved, project-specific refinements to the evaluation design were documented in a high-level Evaluation Plan (EP) and a detailed Evaluation Activity Plan (EAP). In general, the EP describes the project and/or system under evaluation, and lays the foundation for further evaluation activities by developing consensus among the Evaluation Subcommittee and project partners as to which of Showcase's evaluation Goals, Objectives, and Measures best apply to the project.

As the project matured, and after the EP had been approved, an EAP was developed to plan, schedule, and describe specific activities (interviews, surveys, etc.) and step-by-step procedures for conducting the evaluation. Data collection began after both plans had been reviewed and subsequently approved by the Evaluation Subcommittee and the project's partners.

1.3 Organization of this Report

The TravelTIP Evaluation Report provides a background description of the Southern California Priority Corridor and the transportation challenges facing Orange County. This is followed by descriptions of the Showcase Program and the TravelTIP project, including a detailed technical description. The evaluation itself is subdivided and ordered into the five topic areas described below:

System Performance — provides important benchmark information regarding system availability, reliability, scalability and compatibility. The evaluation quantifies those items and could be used to identify needed improvements and help develop specifications for future systems. Since new systems often experience a "shakedown" period during which the developer corrects problems and tunes the system for optimal performance, the system performance evaluation is intended to study the optimized or "steady-state" operation of the system.

Cost — provides important benchmark information regarding funding sources, software licensing, development costs, costs to re-deploy elsewhere or expand the system, and operations and maintenance (O&M) costs. This report includes an estimate of how much it might cost to re-deploy TravelTIP "from scratch" elsewhere in the State, and also looks at the incremental costs for integrating additional partner agencies and/or traveler information kiosks into the existing system.

Institutional Impacts — provides important information regarding the administrative, procedural and legal impacts resulting from the deployment of TravelTIP. Such impacts include changes in operator workloads, responsibilities and job turnover rates, as well as changes and limitations of agency-wide policies, procedures and guidelines.

Transportation & Traveler Information Management — provides important benchmark information on system usage and user acceptance (by both agency operators and the general public). This report provides both quantitative and qualitative findings on those items and can be used to identify user demand, needed improvements and potential areas of future growth.

Transportation System Impacts — provides important information regarding TravelTIP's impacts on transit usage, traffic congestion, air quality, and traffic safety.

The report concludes with a summary, final remarks and recommendations for next steps. Several appendices contain supporting documentation such as technical designs and copies of evaluation data collection instruments (blank questionnaires and survey).

1.4 Privacy Considerations

Some of the information acquired in the interview and discussion process could be considered sensitive and has been characterized in this report without attribution. The Evaluation Team has

taken precautions to safeguard responses and maintain their confidentiality. Wherever possible, interview responses have been aggregated during analysis such that individual responses have become part of a larger aggregate response. The names of individuals and directly attributable quotes have not been used in this document unless the person has reviewed and expressly consented to its use.

1.5 Constraints & Assumptions

The TravelTIP evaluation is subject to the following constraints and assumptions:

- The project's consultant was not required to disclose actual project expenses, so the project's cost is based on the fixed-price budget stipulated in the TravelTIP contract and its amendments. The budget reflects the expenses and costs for services paid by the client agency, but not necessarily the actual detailed costs for goods and services comprising the project.

1.6 Project Background

1.6.1 The Southern California Priority Corridor

In 1993, the U.S. Department of Transportation designated Southern California as one of four Priority Corridors in which Intelligent Transportation Systems (ITS) could have particular benefit. The Southern California Priority Corridor, illustrated in Exhibit 2, is one of the most populated, traveled, and visited regions in the country. Roughly two-thirds of the state's population – about 20 million people – resides in or around the Southern California Priority Corridor. It suffers from extreme traffic congestion, limited room for expanding transportation facilities, and above-average air pollution levels.

The Southern California Priority Corridor consists of four distinct regions that correspond with the four Southern California Caltrans districts:

- Los Angeles/Ventura (Caltrans District 7)
- Orange County (Caltrans District 12)
- San Diego (Caltrans District 11)
- Inland Empire (Caltrans District 8)

Exhibit 2 – The Southern California Priority Corridor and Vicinity

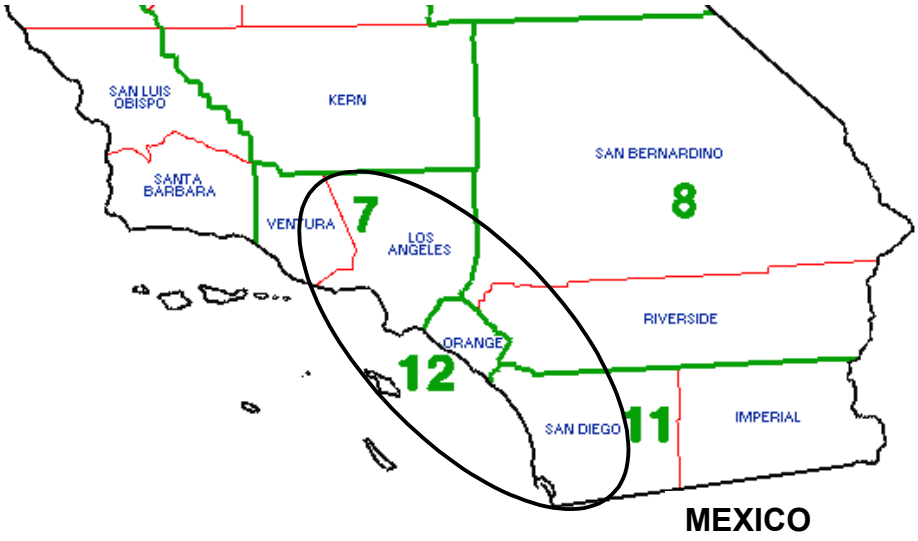


Exhibit 3 – Population and Number of Registered Vehicles by County

County	Population[2] (as of 7/1/2001)	Registered Vehicles[3]* (as of 12/31/2000)	Caltrans District
Los Angeles	9.7 million	6.2 million	7
Orange	2.9 million	2.1 million	12
San Diego	2.9 million	2.1 million	11
San Bernardino	1.8 million	1.1 million	8
Riverside	1.6 million	1.1 million	8
Ventura	0.8 million	0.6 million	7
Imperial	0.15 million	0.1 million	11
Total	**19.85 million**	**12.7 million**	

*Includes autos, trucks, and motorcycles. Trailers not included.

1.6.2 The Southern California Priority Corridor's ITS Showcase Program

The ITS Showcase Program is one of several programs that have been implemented in Southern California's Priority Corridor to help aid mobility and mitigate traffic congestion and its associated environmental impacts.

Exhibit 4 lists the 17 ITS projects in the Showcase Program. These projects collectively form a corridor-wide intermodal transportation management and information network between Los Angeles, Orange County, San Diego, and the Inland Empire. Eleven of the projects are regional in nature, while the remaining six are corridor-wide in scope.

In the same year that Southern California was designated as a Priority Corridor, The Orange County Transportation Authority (OCTA) was one of the first public agencies in the nation to

complete a Master Plan for ITS. Contained in Orange County's 1993 ITS Master Plan was the vision for the TravelTIP system.

TravelTIP became one of the 17 projects that comprise the Southern California Priority Corridor ITS Showcase Program. The 17 Showcase projects are listed below by region. Eight of the projects, including TravelTIP, were fast-tracked and designated "Early Start" projects because of their importance as base infrastructure and potential to act as role models for the rest of the Showcase Program.

Exhibit 4 – The 17 Showcase Projects and their Status as of February 2004

Project	RFP Issued	Contractor Selected	Contract Executed	Project Underway	Project Complete
Corridor-wide					
Scoping & High Level Design (Kernel)*	✓	✓	✓	✓	✓
Strategic Planning/Systems Integration	✓	✓	✓	✓	✓
CVO🗎					
ATIS	✓	✓	✓	✓	✓
ATMS🗎					
Rideshare	✓	✓	✓	✓	✓
Los Angeles Region					
IMAJINE*	✓	✓	✓	✓	✓
Mode Shift*	✓	✓	✓	✓	
LA ATIS	✓	✓	✓	✓	✓
Inland Empire Region					
Fontana-Ontario ATMIS	✓	✓	✓	✓	✓
Orange County Region					
TravelTIP*	✓	✓	✓	✓	✓
OCMDI	✓	✓	✓	✓	✓
San Diego Region					
InterCAD*	✓	✓	✓	✓	✓
Mission Valley ATMIS*	✓	✓	✓	✓	✓
IMTMS/C (ATMSi)*	✓	✓	✓	✓	
Traffic Signal Integration (RAMS)	✓	✓			
Transit Management System*	✓	✓	✓	✓	

* Indicates an "Early Start" project.
🗎 CWCVO and CWATMS do not yet have approved workplans.

2 Project/System Technical Description

TravelTIP provides traveler information regarding traffic congestion and roadway "events" for most of Orange County. Although there are other existing ATIS services in the region that provide real-time traveler information for the highways, TravelTIP is unique in that it provides real-time information for both highways and many major arterials as well.

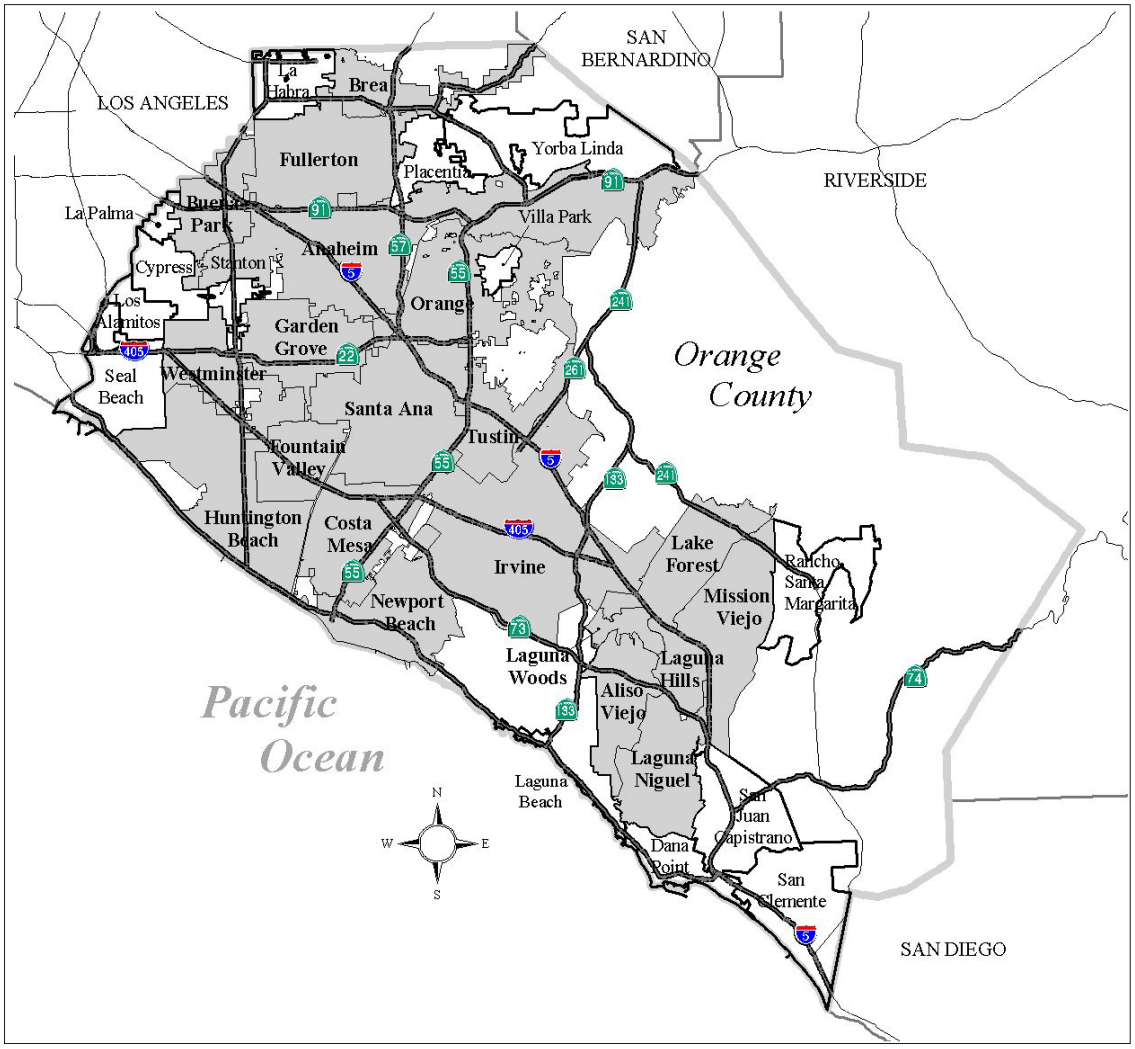
TravelTIP interfaces with Caltrans (District 12) and 16 other local transportation agencies to obtain real-time traffic sensor data and advisories. These agencies include:

- Anaheim
- Brea
- Buena Park
- Caltrans District 12
- Costa Mesa
- Fountain Valley
- Fullerton
- Garden Grove
- Huntington Beach
- Irvine
- Mission Viejo
- Newport Beach
- OCTA
- Orange (city)
- Orange (county)
- Santa Ana
- Tustin
- Westminster

The County of Orange provides data from the unincorporated areas of the county, as well as for the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, and Lake Forest.

As Exhibit 5 shows, these partner agencies (shaded) geographically make up the majority of Orange County and provide TravelTIP with extensive coverage of the county's highways and arterials.

Exhibit 5 – Geographic Coverage of Orange County's TravelTIP System

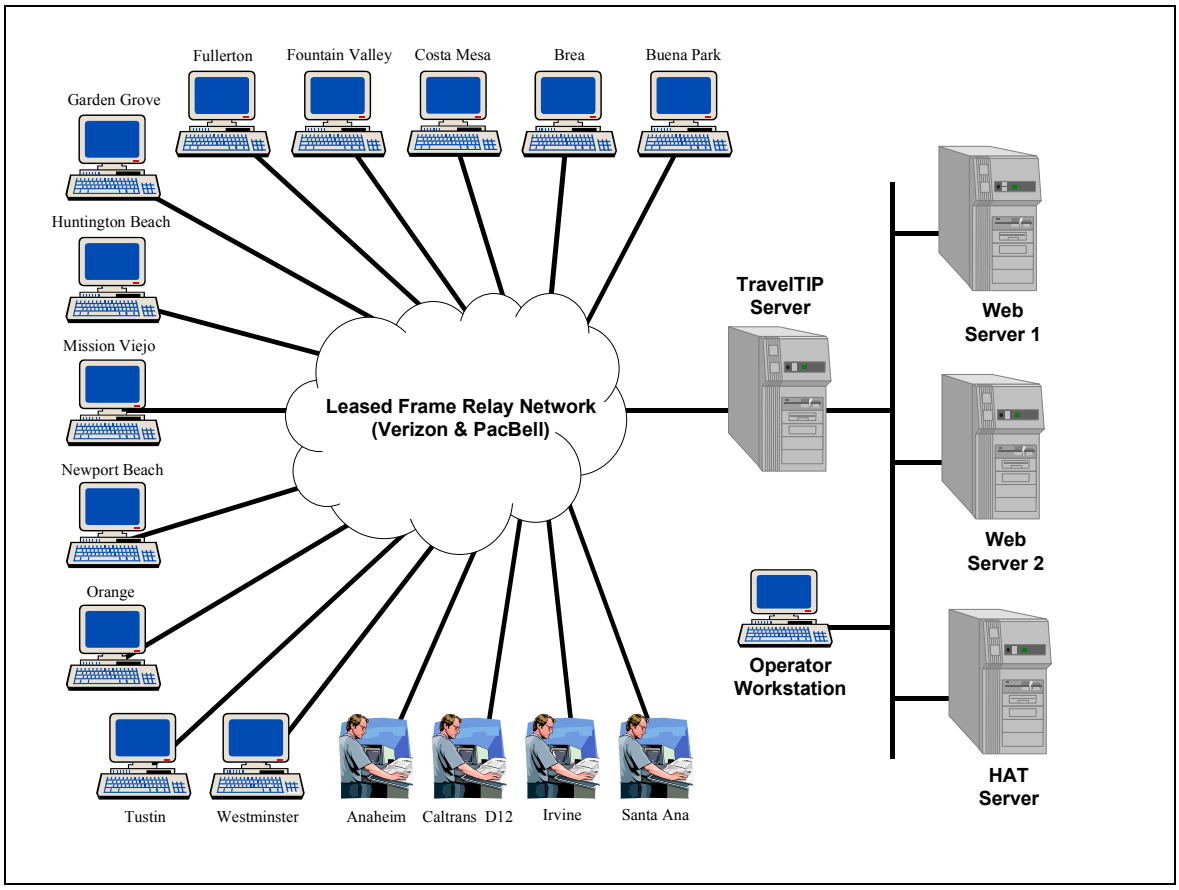


These agencies also represent a diverse cross-section in terms of ITS experience and the amount of ITS infrastructure they had in place prior to TravelTIP. Anaheim, Caltrans District 12, Irvine, and Santa Ana have been active in ITS for many years and had various legacy ITS systems in place. The remaining agencies did not. This diversity in legacy systems added a layer of complexity (and cost) to the TravelTIP implementation in that some customization was required for each partner in order to successfully integrate all of the systems. Appendix A provides additional information about each partner agency.

Exhibit 6 provides a high-level overview of the TravelTIP system design. Traffic data consisting of volumes and lane occupancies is extracted from each agency's centralized traffic signal control system or ATMS. The data is then communicated to the "TravelTIP Server" where it is converted into Showcase objects. The data is fused, processed and made publicly available as traveler information via a website, Highway Advisory Telephone (HAT) service, and three strategically located kiosks. This process is broken down and described in more detail in the following paragraphs.

Step 1: Extraction of Traffic Data – In this step, custom software developed under TravelTIP extracts real-time volume and lane occupancy data from the agency's centralized traffic signal control system or ATMS. This custom software is referred to as a "bridge" and it must be tailored to the particular legacy system with which it will interface. Since most of the agencies use either an Econolite or Multisonics VMS-330 system, some software reuse was possible. For example, only one type of bridge needed to be developed for the agencies that use an Econolite system. Once developed, that bridge software was reproduced, installed and used at all of the other partner agencies that use Econolite. Additional types of bridges were developed for two versions of Multisonics' VMS-330, and the ATMSs at Anaheim, Caltrans District 12, Irvine and Santa Ana. Since a bridge is tailored to a specific legacy system, any upgrade or replacement of the legacy system could render the bridge obsolete and unable to exchange data. In the near term, region-wide configuration management will be important for monitoring and managing such changes and minimizing downtimes. In the long term, further development and adoption of NTCIP resulting in the standardization of ATMS and traffic signal control system interfaces will remove the need for customized software bridges altogether. The bridge software runs on Remote Workstations (RWS) that were procured during the project and installed in each respective agency office or TMC.

Exhibit 6 - TravelTIP High-Level System View



Step 2: Communication of Data – The bridge software installed at each agency transmits the extracted real-time traffic data to the TravelTIP Server (at the Caltrans District 12 TMC) for

fusion and processing. Leased Frame Relay service provides the connection between the local agencies and the central TravelTIP system. The data is transmitted every 60 seconds using TCP/IP.

Step 3: Conversion to Showcase Objects – One of the most important legacies of TravelTIP and the Showcase Program could be its development of standard object definitions. These object definitions provide a standard for representing transportation entities such as traffic detector stations, roadway segments, transit buses, etc. As the TravelTIP Server receives raw data from the individual agencies, software modules called "factories" convert the data into Showcase objects.

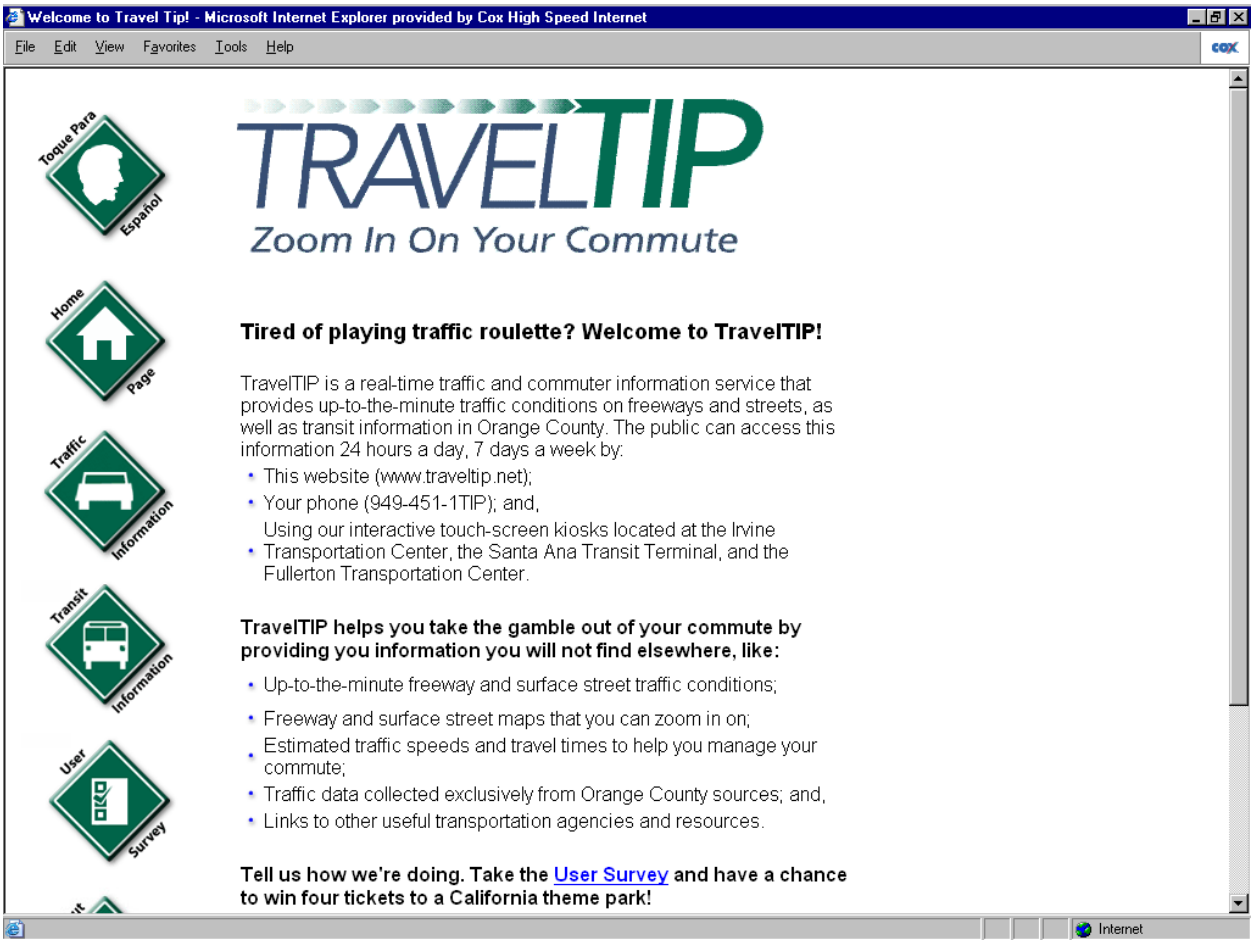
Step 4: Data Fusion and Processing – Data fusion takes place at the TravelTIP Server, which performs the functions of an application server and a firewall.

Step 5: Dissemination of Traveler Information – The TravelTIP Server works with the Web Servers (two of them) and the HAT Server to provide traveler information to the public. A description of these services follows.

The TravelTIP Website

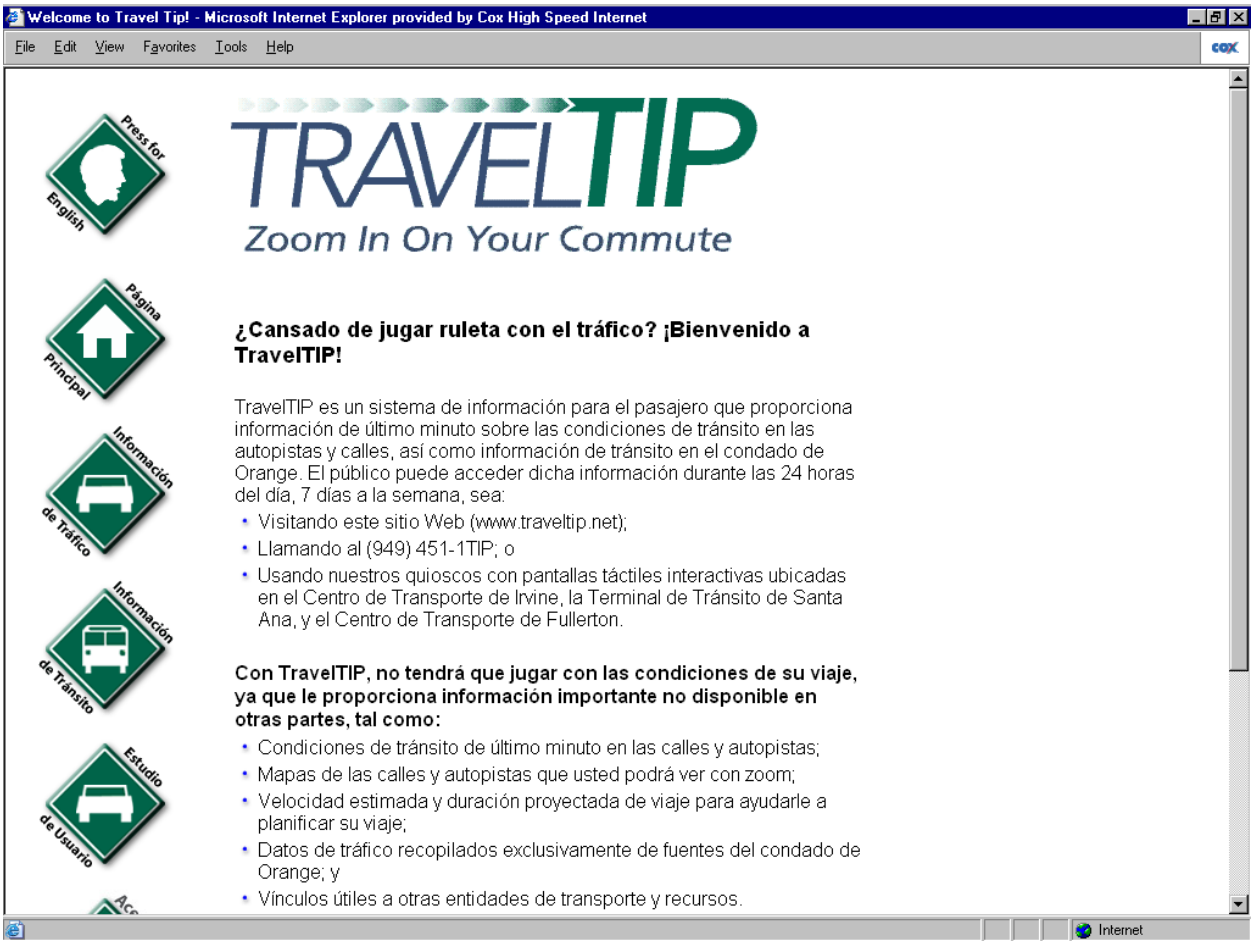
The most often used TravelTIP service is the website, which provides real-time traffic information, as well as links to other sites that provide information regarding transit and other travel modes. The TravelTIP homepage, which is located at ***www.traveltip.net***, is shown below.

Exhibit 7 – TravelTIP Website Homepage in English



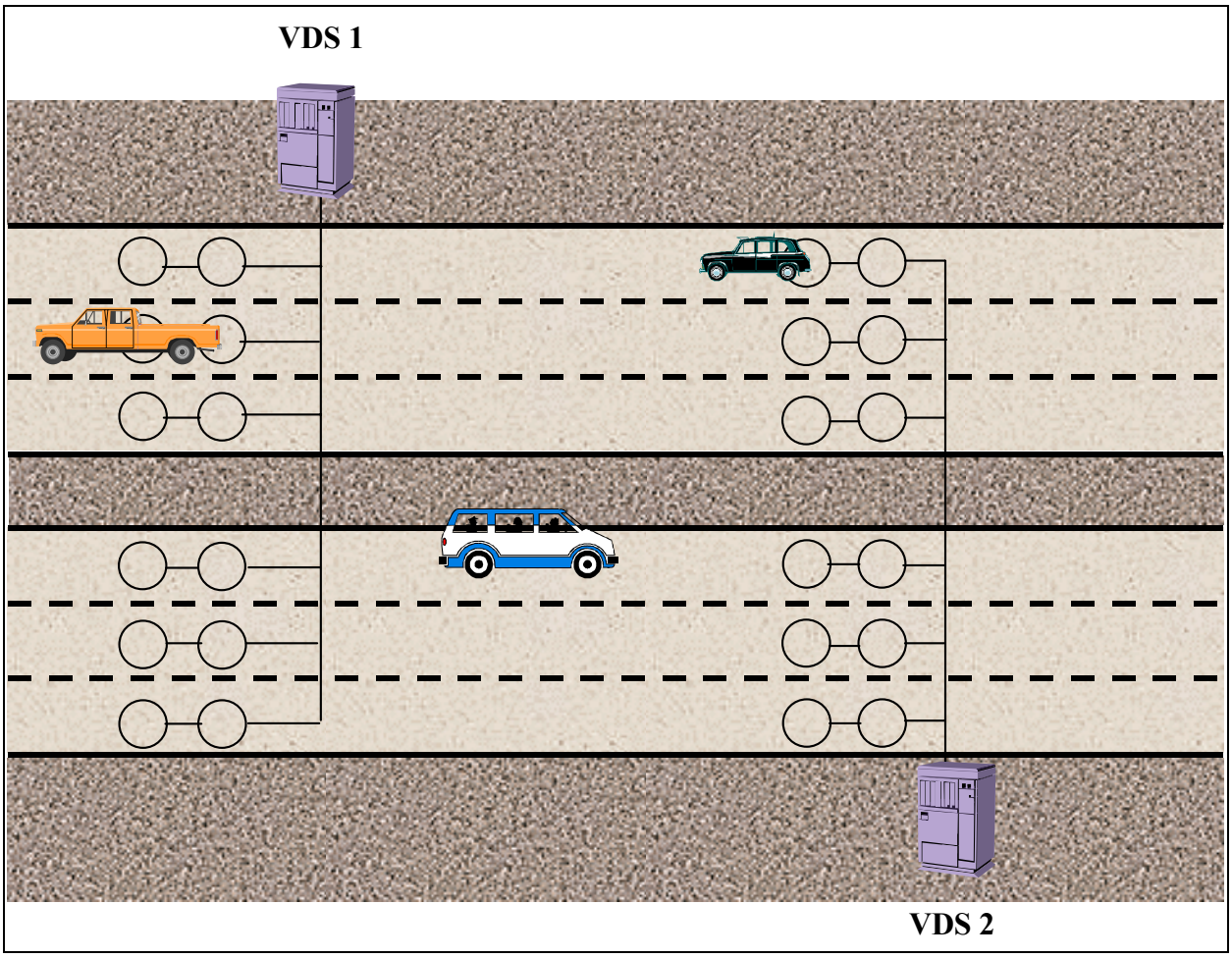
Although the default language for the site is English, a button located at the top left side of the screen allows Spanish-speaking users to view the site in their own language. This is an important feature both for local Hispanic-American commuters, and for Spanish and Mexican travelers who visit Orange County for business and tourism.

Exhibit 8 – TravelTIP Website Homepage in Spanish



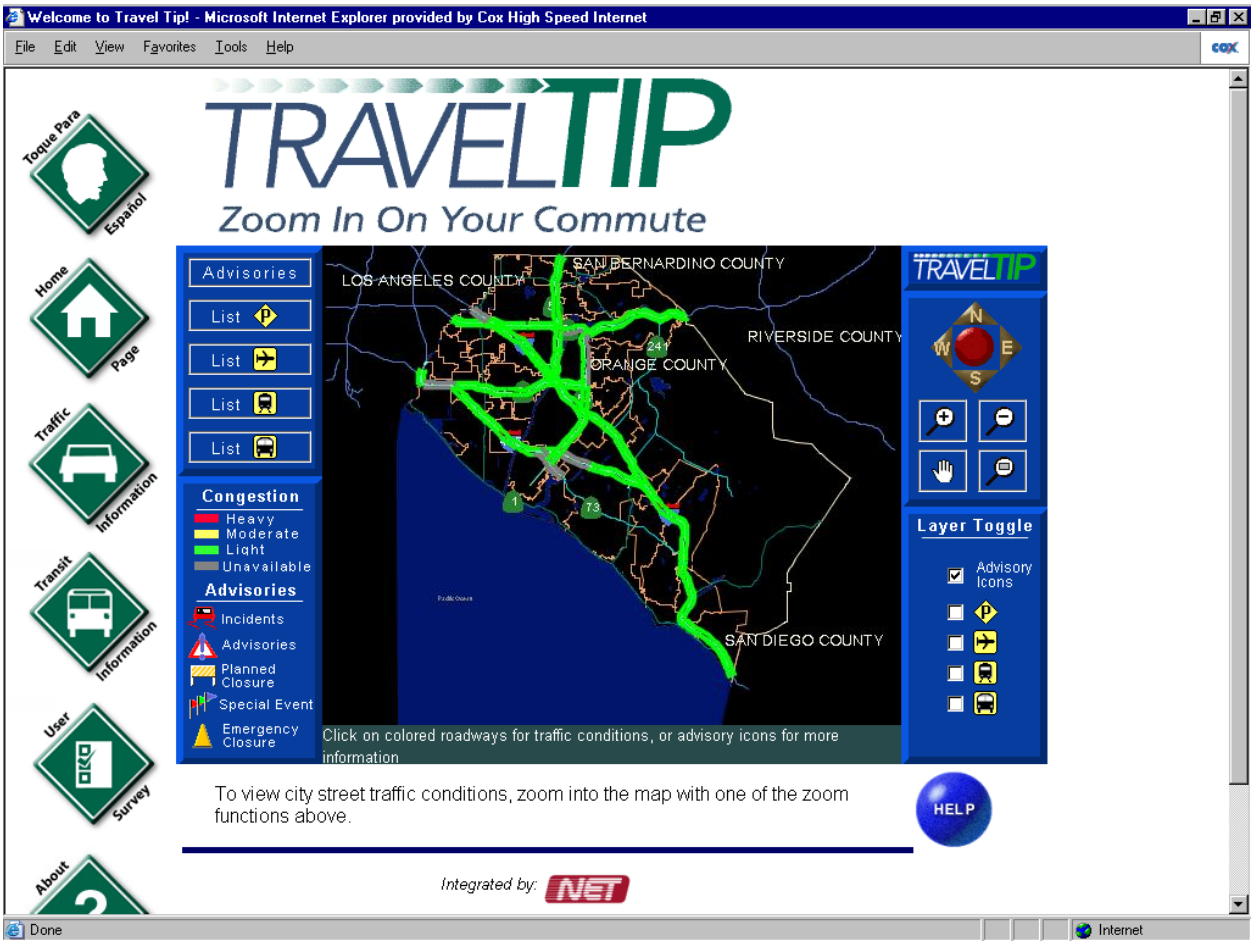
The TravelTIP website's primary feature is a color-coded traffic flow map of the county's highways and major arterials. The site first presents a high-level view of the entire county with only the highway system depicted. Each color-coded highway segment represents data from 2-3 vehicle detector stations (VDSs), and each VDS represents aggregate data from one or two loop detectors per lane. This setup helps compensate for faulty or inaccurate loop detectors by averaging out anomalies.

Exhibit 9 – Field Source of TravelTIP Traffic Data



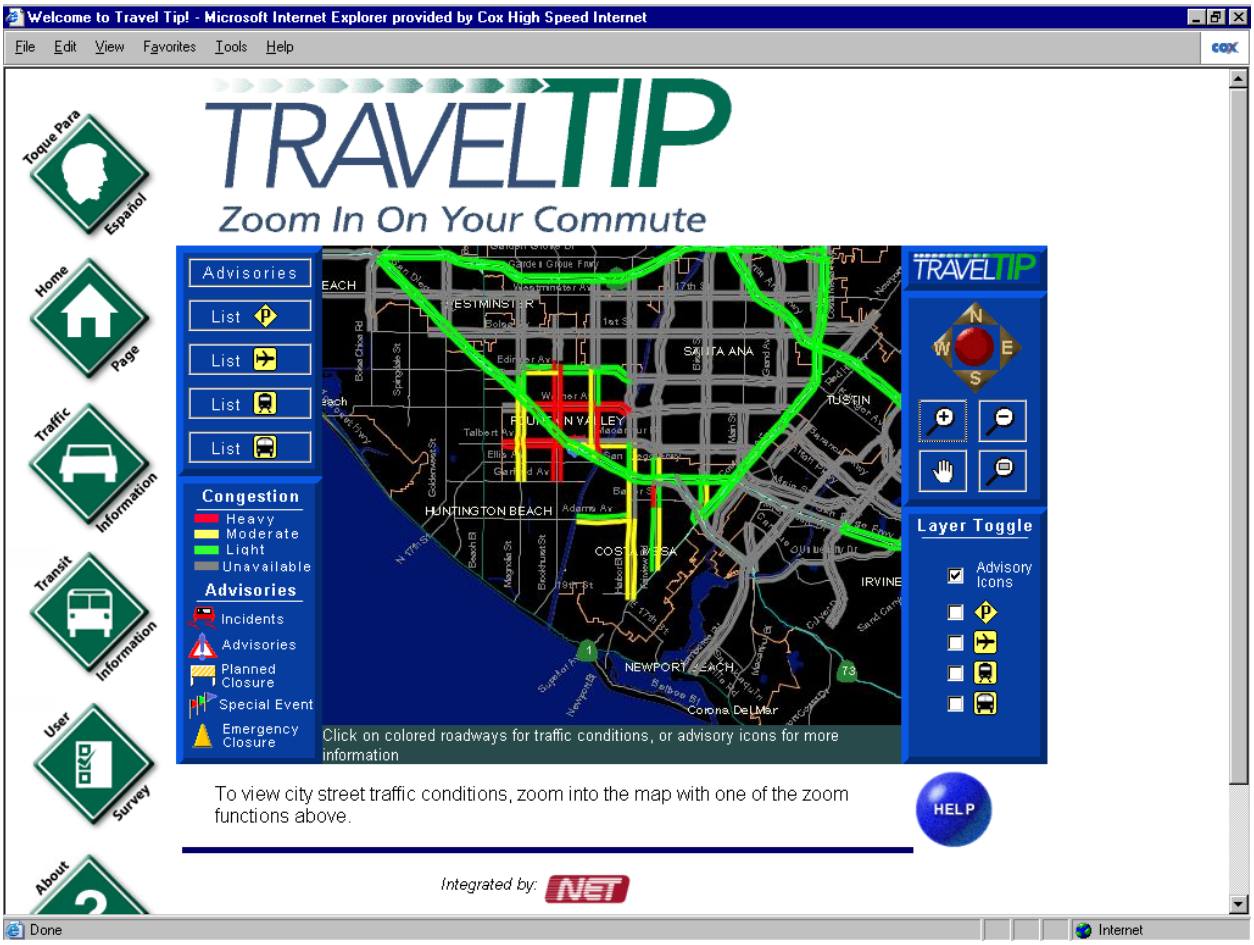
Color-coding of the highway conditions follows the convention set by the Caltrans. Green represents speeds of 35 mph or above, yellow represents speeds between 20-35 mph, and red indicates highway speeds below 20 mph. Grey indicates a segment whose detectors are currently offline.

Exhibit 10 – TravelTIP Website Traffic Conditions Page (Initial View)



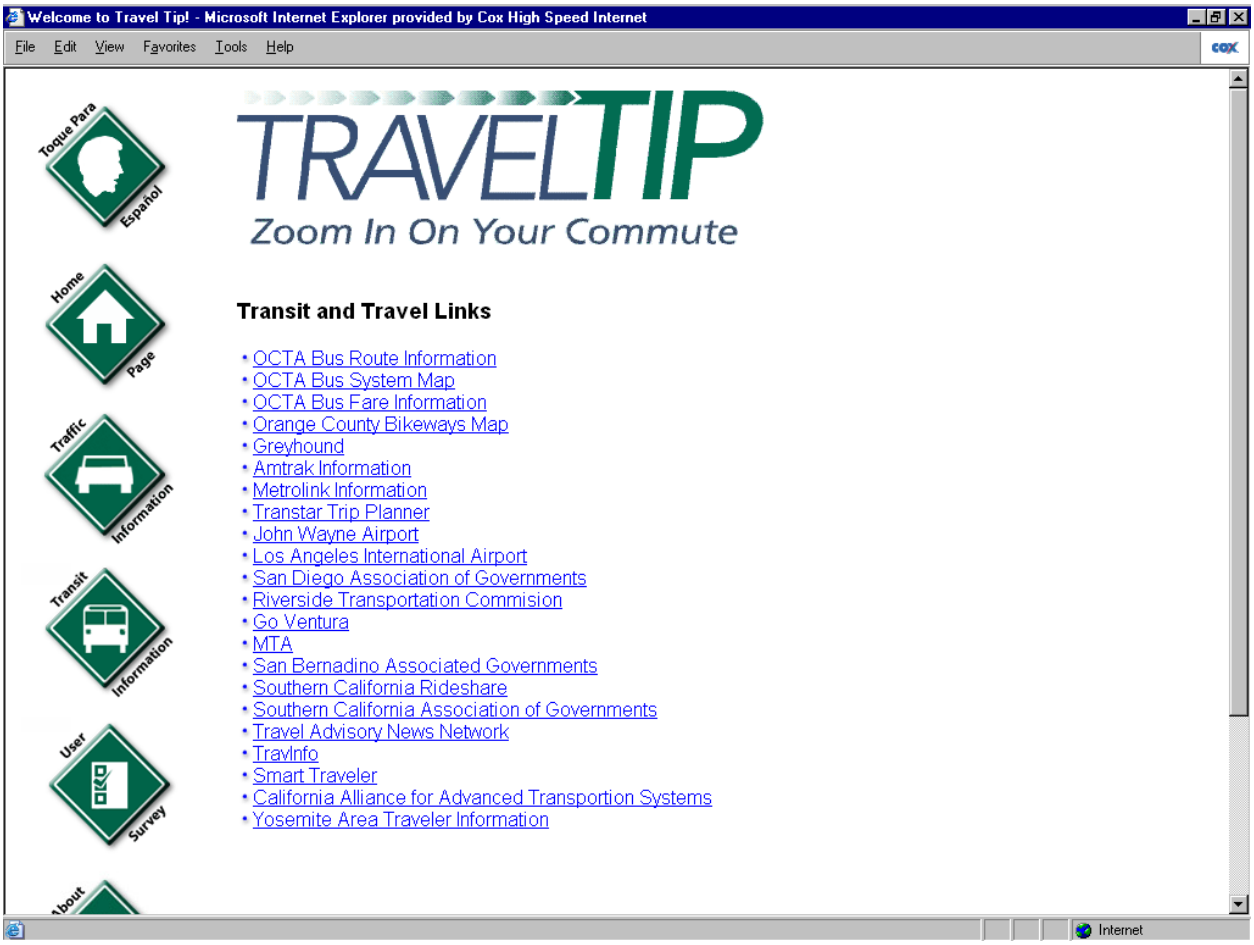
The zoom tool _____ is used to get a closer, more detailed view that reveals arterial conditions. Similar to the highway conditions, arterial traffic conditions are color-coded in red, yellow and green. Red indicates arterial speeds of 0-10 mph, yellow indicates arterial speeds of 11-20 mph, and green indicates arterial speeds of 21 mph and above.

Exhibit 11 – TravelTIP Website Traffic Conditions Page (Arterial Street View)



TravelTIP's Transit Information page provides convenient hotlinks to various other transportation-related websites in the region, including transit providers, airports, and government agencies. For example, a user could quickly jump to the OCTA website (www.octa.net) for information regarding the agency's bus routes, schedules, and fares.

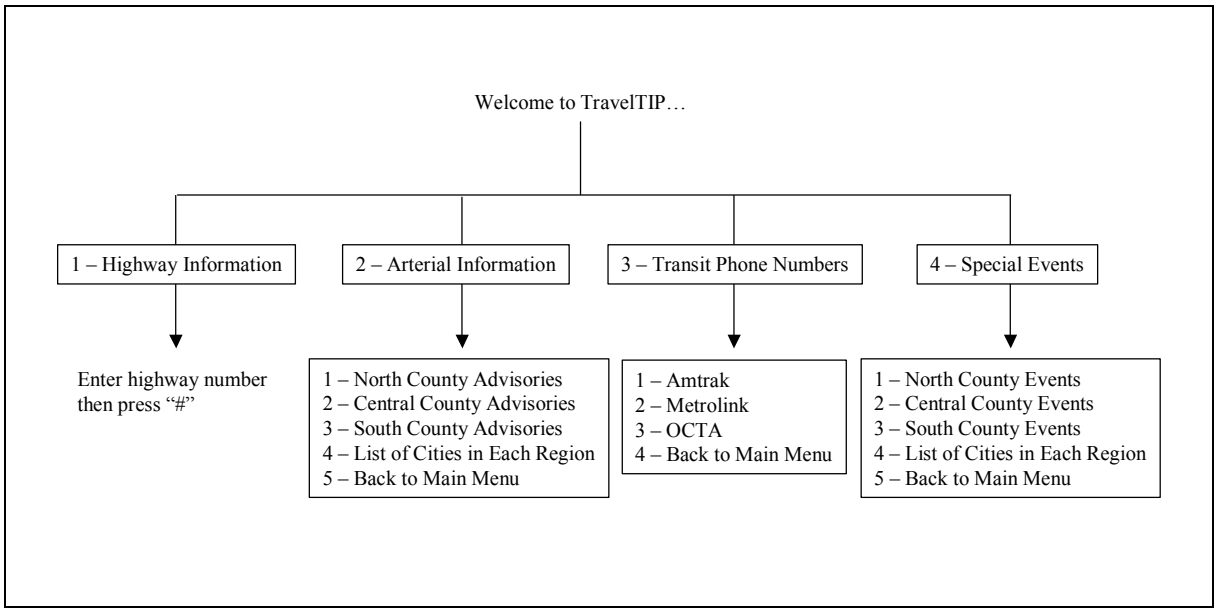
Exhibit 12 – TravelTIP Website Transit Links Page



The TravelTIP Highway Advisory Telephone (HAT) Service

TravelTIP's HAT is accessible from any touch-tone phone by dialing 949-451-1TIP (949-451-1847). The system uses a text-to-speech algorithm to relay audible advisories about current roadway incidents. Users can navigate through the system's menus, depicted in Exhibit 13, to obtain information about the specific roadways that affect their commute.

Exhibit 13 – TravelTIP HAT Menu Structure



Highway information is obtained by entering the highway number followed by the pound sign (#). Information is available for the following Interstates and freeways:

- Interstate 5
- CA 22
- CA 55
- CA 57
- CA 73
- CA 91
- CA 133
- CA 241
- Interstate 405
- Interstate 605

The arterial information and special events information are broken down and organized into three groups: North Orange County, Central Orange County, and South Orange County. The cities that fall into each of these groups are listed below. Some cities overlap the group boundaries and are included in more than one group.

North Orange County	Central Orange County	South Orange County
▸ Anaheim	▸ Corona del Mar	▸ Aliso Viejo
▸ Brea	▸ Costa Mesa	▸ Corona del Mar
▸ Buena Park	▸ Fountain Valley	▸ Dana Point
▸ Cypress	▸ Garden Grove	▸ Irvine
▸ Fullerton	▸ Huntington Beach	▸ Laguna Beach
▸ Garden Grove	▸ Irvine	▸ Laguna Niguel
▸ La Habra	▸ Lake Forest	▸ Lake Forest
▸ La Habra Heights	▸ Los Alamitos	▸ Mission Viejo
▸ La Palma	▸ Newport Beach	▸ Newport Beach
▸ Los Alamitos	▸ Orange	▸ Ranch Santa Margarita
▸ Orange	▸ Rancho Santa Margarita	▸ San Clemente
▸ Placentia	▸ Santa Ana	▸ San Juan Capistrano
▸ Santa Ana	▸ Seal Beach	▸ Trabucca Canyon
▸ Seal Beach	▸ Stanton	
▸ Stanton	▸ Sunset Beach	
▸ Tustin	▸ Tustin	
▸ Westminster	▸ Westminster	
▸ Yorba Linda	▸ Villa Park	
▸ Villa Park		

3 System Performance Evaluation

3.1 The Project/System Development Process and Timeline

TravelTIP's development followed a systems engineering process, but took much longer than originally anticipated.

TravelTIP is the culmination of over eight years of planning and development, beginning with the introduction of the TravelTIP concept in Orange County's 1993 ITS Master Plan. Development of the system took place in two phases. In the first phase, not part of Showcase, OCTA hired a consultant, Rockwell, to gather technical data and prepare a preliminary design consisting of the following documents:

- May 1995 – TravelTIP User Needs Assessment
- January 1996 – Data Monitoring Subsystem Working Paper
- March 1996 – TravelTIP System Requirements Working Paper
- April 1996 – Candidate Elements Working Paper
- April 1996 – TravelTIP System Architecture Working Paper
- June 1996 – TravelTIP Preliminary Design Report
- June 1996 – TravelTIP System Plans, Specifications & Estimates Working Paper

These products were used to help define the Showcase-funded phase 2 and to help select an appropriate consultant team to implement the system. OCTA chose to hire a consultant team of three contractors consisting of:

- System Integrator to implement the system,
- System Manager to provide technical and project management support to the agency,
- Marketing and public outreach consultant to develop a TravelTIP business plan

Separate RFPs for each of these three roles were published in February 1997 and respective consultants were selected by May. National Engineering Technology (NET) was selected as the Systems Integrator to implement the system, PB-Farradyne was selected as System Manager, and Frank Wilson & Associates was selected to develop the business plan and handle public outreach. The project kicked off in July 1997 and steady progress was made over the following three years as indicated by the milestones listed below:

- May 1998 – Draft Software Design Document
- October 1998 – Final Software Design Document
- August 1999 – Draft Installation Plan
- September 2000 – TravelTIP "beta" Version goes operational
- June 2001 – TravelTIP "Media Blitz"

TravelTIP's beta version went operational in September 2000 with a subset of partner agencies providing data. Additional partner agencies were brought online during the end of 2000 and the

first half of 2001. A "media blitz" was held on June 11, 2001 to introduce the system to the local media and gain greater public exposure. The TravelTIP (phase 2) contract was completed, and reached its five-year limit and was closed out on June 30, 2002.

3.2 System reliability, availability, compatibility, and scalability

This section focuses primarily on the system performance of the TravelTIP traveler information website, and addresses reliability, availability, compatibility, and scalability. The extent of the system performance evaluation is limited because the TravelTIP system never reached steady-state operation as characterized by continuous, dependable, optimal operation.

3.2.1 System Reliability and Availability

TravelTIP is not in steady-state operation.

The system's performance was monitored for more than a year following its public unveiling or "media blitz" on June 11, 2001. At that time, nine of TravelTIP's 17 partner agencies were considered to be "online" and providing data to the system:

- Caltrans District 12
- Costa Mesa
- Fountain Valley
- Mission Viejo
- Newport Beach (events only)
- OCTA (events only)
- Orange
- Santa Ana
- Tustin

Much of this data was successfully being processed and rendered on the website's traffic flowmap, as evidenced by color-coded segments on the highways and the major arterials in Costa Mesa, Fountain Valley, Mission Viejo and Tustin.

The TravelTIP contract contained a requirement for NET to operate and maintain the system for 12 months, following which the system would be relocated to the newly built Caltrans District 12 TMC. This "warranty period" began with the release of TravelTIP's beta version in September 2000. Due to delays at the TMC, however, NET operated and maintained the system for an additional six months, during which time the site operated relatively well. The system was offline for approximately six weeks in February-March 2002 as the TravelTIP servers were moved from NET to the new Caltrans District 12 TMC. Since then, the system has not reached reliable steady-state operation, as evidenced by the log in Appendix B. OCTA attributes this to the TMC's firewall configuration (which is set for maximum security) and continuing technical

problems with the leased telecommunications service between the partner cities and the TMC. See the next section for more information.

3.2.2 Compatibility

Tightened network security in reaction to the 9-11 terrorist attacks has made it harder to exchange data.

Compatibility is the ability of two or more systems or components to perform their required functions while sharing the same hardware or software environment. One of the technical issues impacting TravelTIP seems to be related to the security settings of the TMC's router/firewall. These security settings, which were tightened in response to the September 11, 2001 terrorist attacks, are apparently preventing data from the remote workstations from getting through to the TravelTIP Server.

3.2.3 Scalability

As a distributed, object-oriented system, TravelTIP can be scaled to accommodate several additional centers.

Scalability describes the extent to which system usage can grow without sacrificing system performance or requiring architectural or technology changes. For TravelTIP, this refers to the ease with which the system can be upgraded or modified to handle an increasing workload, as well as the ease with which additional partners (local TMCs) can be added to expand the system. The extent and ease with which TravelTIP can be scaled depends on two primary factors:

- Hardware capability
- Software design

Processors (e.g., workstations, servers) and network components (e.g., available bandwidth, routers) must be capable of handling the increased workload. As new centers are added, the amount of data being exchanged and processed might exceed the available bandwidth or have the effect of bogging down the TravelTIP Server and/or the web servers. In this case, additional bandwidth might need to be obtained and server hardware upgraded for more processing power.

Another consideration is the design of the web page. As the system begins receiving data from additional roadway segments (either because an existing partner agency has increased its number of instrumented roadway miles, or because a new partner agency has joined the system), the traffic flow map on the TravelTIP web page will need to be modified to show the data for the new segments. This modification should not be construed as a lack of scalability.

TravelTIP's scalability is further aided by the fact that the software is based on Showcase's non-proprietary, object-oriented design with standardized classes/objects. The object-oriented design helps make the software modular, which aids scalability.

3.3 Impact of Showcase Integration on Project Deployment and System Performance

3.3.1 Impact of TravelTIP on other Showcase Projects

The OCMDI Could Not Obtain Data from TravelTIP as Originally Envisioned

The Orange County Model Deployment Initiative (OCMDI) developed a system through which private sector Information Service Providers (ISPs) can obtain public transportation data (such as traffic speeds) for value-added redistribution to consumers. The OCMDI was to obtain much of its transportation data from TravelTIP via the Showcase Network; however, as explained in section 3.3.2, TravelTIP is not yet connected to the network.

Although proposals to integrate the OCMDI system directly to TravelTIP were discussed, OCTA has elected to wait until TravelTIP is integrated with the Showcase Network. In the interim, the OCMDI has negotiated and established data feeds from several other sources, but does not obtain data from TravelTIP.

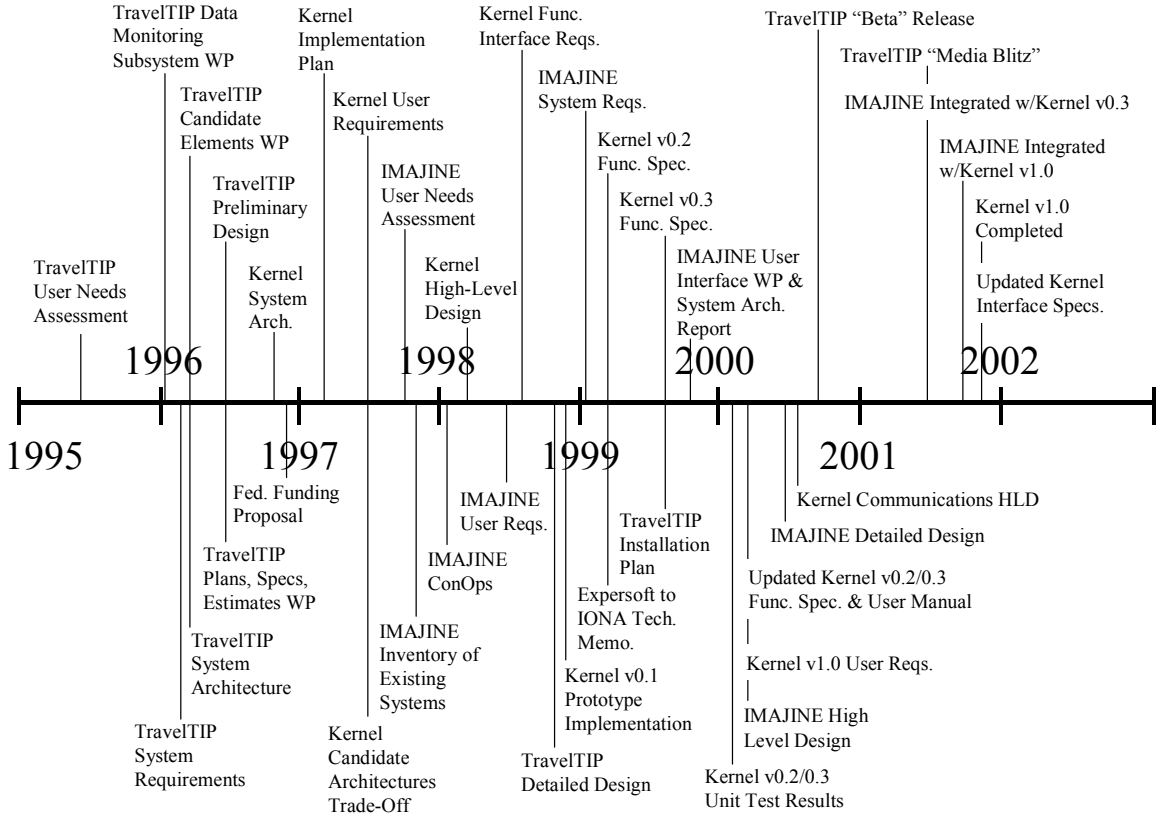
3.3.2 Impact of other Showcase Projects on TravelTIP

Delay of the Showcase Kernel Prompted Development of "Kernel-lite"

The four regional "Kernels" are the centerpiece of the Showcase Architecture, and were developed under Showcase's Scoping & Design project. More specifically, the Kernels are identical servers that help manage the Showcase Network, authorize agency centers that wish to log on to the network, and provide additional "common services" such as location translation, "yellow pages," publish & subscribe, and query tools. Regional systems that wish to exchange information across the interregional Showcase Network must contain software to communicate and interface with the Kernels.

As shown in Exhibit 14, the Kernels were developed in parallel with TravelTIP and project IMAJINE. Although this situation might have helped perfect the Kernel design, it nonetheless slowed development of all three projects.

Exhibit 14 – Joint Timeline of the TravelTIP, IMAJINE and Kernel Early Start Projects



In an effort to stay on schedule, TravelTIP opted to develop its own "Kernel-lite," which mimics some of the Kernels' services, but does not provide access to the Showcase Network. Although the decision to create Kernel-lite allowed system development to continue unabated – and resulted in a partially operational system in September 2000 – the system is not yet integrated with the interregional Showcase Network. Plans and cost estimates to integrate the system with the interregional Kernel network are under development.

4 Cost Evaluation

The cost evaluation draws information from documented costs and personal interviews. Budget information was taken directly from the project's contracts and amendments, while operations and maintenance costs were obtained from discussions with agency personnel. Informal interviews were conducted to verify information and fill in any "holes" that were discovered during analysis.

4.1 Constraints & Assumptions

There are three primary considerations for the Cost Evaluation:

- Since TravelTIP was funded through a firm fixed price contract, the project's budget information reflects the expenses and costs for services paid by the client agency, but not necessarily the actual costs for goods and services borne by the contractor.

- Operations and maintenance (O&M) costs have been estimated based on available information and certain assumptions indicated later in this section.

- The System Developer, NET, was under contract to provide twelve (12) months of operations and maintenance support for TravelTIP. This period began in September 2000 with the release of TravelTIP's beta version. During this period, NET hosted the TravelTIP system (i.e., the servers), tuned and improved the website's performance, and continued working to bring additional partner agencies online. Due to delays in relocating the TravelTIP servers to the newly constructed Caltrans District 12 TMC, NET provided an additional six (6) months of system O&M support beyond their contractual requirement. The equipment was removed from the NET facility in February 2002.

4.2 Project Budget & Estimated Development Costs

4.2.1 Project Budget

An evolving Kernel design and the inclusion of additional partner cities into the project increased the TravelTIP integration effort. This required the System Integration contract budget to be increased by nearly 30%.

Four prime contracts were utilized to design, build, and market the TravelTIP system. These contracts, and their respective contractors, are:

- IVHS Design & Analysis (Rockwell)
- TravelTIP System Integrator (NET)
- TravelTIP System Manager (PB-Farradyne)
- TravelTIP Business Plan, Marketing and Outreach (Frank Wilson & Assoc.)

Exhibit 15 shows that $4,676,462 was allocated for these four contracts. Roughly 70% of the funding came from the federal government (FHWA), 10% came from the State of California (Caltrans), and the remaining 20% came from OCTA. No funding contribution was required from the participating cities that provide and receive data and information through the system.

Exhibit 15 – Total Budgets of the Four TravelTIP-related Contracts

Contract	Contractor	Contract End Value	Percentage
IVHS Design & Analysis	Rockwell	$450,000	9.6%
TravelTIP System Integrator	NET	$3,875,961	82.9%
TravelTIP System Manager	PB-Farradyne	$150,501	3.2%
TravelTIP Business Plan, Marketing and Outreach	Frank Wilson & Assoc.	$200,000	4.3%
		$4,676,462	100%

The System Integrator contract is broken down into more detail in Exhibit 16, which lists that contract's ten tasks and the budget associated with each one.

Exhibit 16 – TravelTIP Systems Integration Budget per Task

Task/Cost Item	Initial Budget	Initial %	Final Budget	Final %
Task 1 – Project Management	$345,000	11.5%	$445,417	11.5%
Task 2 – System Design	$117,240	3.9%	$139,440	3.6%
Task 3 – Field Infrastructure	$71,000	2.4%	$109,656	2.8%
Task 4 – System Hardware	$162,950	5.4%	$172,950	4.5%
Task 5 – COTS & Custom Software Development	$1,194,700	39.9%	$1,202,604	31.0%
Task 6 – System Prototypes	$296,440	9.9%	$296,440	7.6%
Task 7 – System Installation, Integration, and Test	$167,000	5.6%	$242,409	6.3%
Task 8 – System Operation, Maintenance, and Support	$260,020	8.7%	$504,980	13.0%
Task 9 – Training	$138,880	4.6%	$153,250	4.0%
Task 10 – System Upgrades (Optional)	$239,700	8.0%	$608,815	15.7%
Total	**$2,992,930**	**100.0%**	**$3,875,961**	**100.0%**

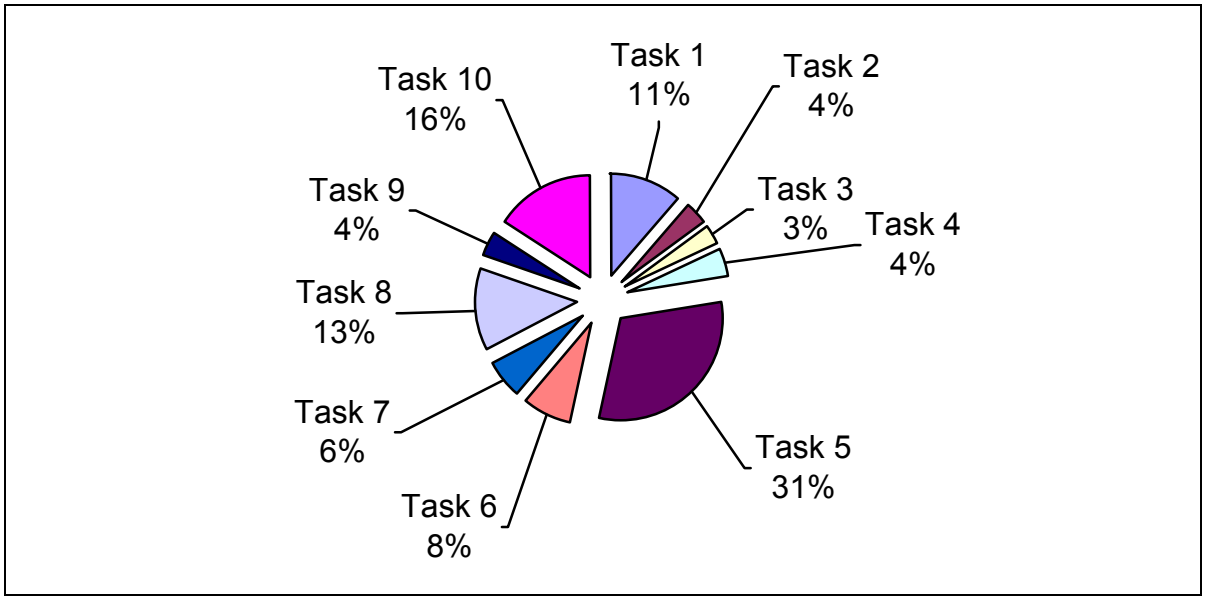
The budget to develop the system was revised four times during the project, resulting in a 30% increase over the initial budget. The first budget increase was made to accommodate several additional partner agencies. The added cost to add each of these agencies depended on their existing traffic signal system technology. Six (6) additional VMS-330 cities were added (bringing the total to ten), as were the four TMCs (Caltrans District 12, Anaheim, Irvine and Santa Ana) and one QuicNet site. Most of the impact of the first budget increase is seen in increased spending on field infrastructure.

The second budget increase was the result of a couple of factors. First, due to delays in the delivery of the needed v0.2 Kernel, TravelTIP developed "Kernel-lite" as a stopgap measure to provide basic services until the Kernel software could be delivered. Second, additional money was also appropriated for the development of a Showcase interface (CORBA IDL and Seed) for the City of Anaheim.

The third and fourth budget increases appropriated additional funding for NET's continued hosting and support of the TravelTIP system until it could be relocated to the newly constructed Caltrans District 12 TMC.

Despite the uncertainties inherent in developing custom software, the software development budget itself was increased by less than 1% over the five-year project.

Exhibit 17 – Final Distribution of TravelTIP Budget by Task



Hardware alone cost the TravelTIP project an estimated $140,400 - $143,400. This cost does not include the Materials and Handling (M&H) fee often charged by contractors. The amount of the fee varies between contractors, but is typically on the order of 10% of the hardware purchase price. Although an agency can save the M&H fee by procuring the hardware itself, this benefit must be weighed against the potential timesavings of avoiding the formal procurement process by having the contractor make the purchase.

Exhibit 18 – TravelTIP Hardware Costs

Hardware Item	Model	Installed OS/Software	Unit Cost❶	Total Cost
TravelTIP Application Server	HP K220	HP-UX 10	$20,000 - $23,000	$23,000
2 Web Servers	HP D230	HP-UX 10	$22,000	$44,000
HAT Server	HP D230	HP-UX 10	$22,000	$22,000
2 Operator Workstations	PC	Windows NT	$2000	$4000
12 Remote Workstations	Sun Ultra 5	Solaris 7	$2300	$27,600
15 typical 21" color monitors			$1520	$22,800
				$143,400

❶ Cost of a single server or workstation at time of purchase in 1999.

Most of the system's hardware was procured just prior to – or early into – the project's implementation phase so that the software development could be done on those machines. Although this approach greatly reduces the risk of incompatibility and helps ensure a successful implementation, agencies should be aware that rapid advancement in technology could result in the hardware becoming obsolete prior to project completion. There is more discussion regarding planning for system upgrades in the section on Operations and Maintenance (O&M).

4.2.2 Design Once, Deploy Many Times

"Design Once, Deploy Many Times" is the Priority Corridor's philosophy for achieving cost efficiency through a modular system design, software re-use, and "economy of scale." In general, Showcase supports the "design once, deploy many times" philosophy through the use of CORBA IDL and the Kernel-Seed architecture.

Since TravelTIP integrated to several similar VMS-330 systems, the bridge (or Seed) for that legacy system only had to be designed and developed once and then deployed several times. Minor complications arose, however, when a couple of cities decided to upgrade to a newer version of VMS-330. Since a bridge is tailored to the specific legacy system to which it interfaces, an upgrade or replacement of the legacy system runs the risk of rendering the bridge obsolete and inoperable. This would prevent the agency from exchanging data with TravelTIP until a new bridge could be developed and installed. In the near term, formal configuration management is important for monitoring and managing such changes and minimizing downtimes. In the long-term, further developments in NTCIP resulting in the standardization of ATMS and traffic signal control system interfaces will remove the need for customized software bridges altogether.

4.3 Estimated Operations & Maintenance (O&M) Costs

TravelTIP's O&M costs are almost entirely covered by OCTA. The estimated annual costs are roughly $72,000-$75,600 for operations and another $40,000 for maintenance.

4.3.1 Operations

The operations cost for TravelTIP has been broken down into three contributing components: labor costs, utility costs, and office space costs. Each of these cost components applies in a varying degree to each project participant. For example, not all agencies plan to continuously monitor their Remote Workstations or to hire technicians specifically for that purpose. An agency that wishes to estimate what its costs would be if it joined TravelTIP should review and add up the itemized costs that best apply to its planned mode of operation.

4.3.1.1 Labor

TravelTIP workstations provide a user interface for entering and viewing advisories about known incidents, scheduled maintenance, and other events that might impact traffic. While larger TMCs might find it necessary to assign one or more Full-Time Equivalent (FTE) staff to monitor and enter advisories, this is probably not warranted (and certainly not cost-effective) for smaller TMCs. An agency that already has a staffed TMC might simply add TravelTIP duties to a technician's existing responsibilities and report no additional cost to operate the system.

The system is otherwise designed to operate autonomously by extracting traffic sensor data from local agencies and processing it to publish the website and HAT.

4.3.1.2 Utilities

The utility costs that are most attributable to the addition of the TravelTIP system are electricity (for powering the needed servers and workstations) and telecommunications (for interagency communications). Some partner agencies experience a greater cost impact than others, depending on the number of legacy systems already in place. Exhibit 19 estimates the additional annual electricity cost impact produced by TravelTIP hardware. These estimates are based on the following assumptions:

- An average electricity rate of $0.16 per kW-hour (the actual rate varies seasonally)
- Servers operate 24 hours per day, 365 days per year
- PCs, workstations, and monitors operate 8 hours per day, 350 days per year

Exhibit 19 – Estimated Marginal Annual Electricity Costs for TravelTIP

Hardware Item	Model	Power Draw	Power Cost	Est. Annual Cost
TravelTIP Application Server	HP K220	1250W	$0.16/kW-hr	$1752
2 Web Servers	HP D230	350W ea.	$0.16/kW-hr	$981
HAT Server	HP D230	350W	$0.16/kW-hr	$491
2 Operator Workstations	PC	250W ea.	$0.16/kW-hr	$224
12 Remote Workstations	Sun Ultra 5	250W ea.	$0.16/kW-hr	$1344
15 typical 15” color monitors	various	15W-110W ea.	$0.16/kW-hr	$941
				$5733

Telecommunications makes up the greatest portion of the monthly operating cost, and this cost is entirely paid for by OCTA. Referring back to Exhibit 6, TravelTIP’s telecommunications needs consist of the following:

Exhibit 20 – Monthly and Annual Telecommunications Costs

Description	Monthly Unit Cost	Total Monthly Cost	Total Annual Cost
16 leased Frame Relay connections between the local agencies and the TravelTIP hub.	$220-$230 each	$3520-$3680	$42,240-$44,160
3 leased Frame Relay connections between kiosks and the TravelTIP hub.	$220-$230 each	$660-$690	$7920-$8280
LAN connection between hub and TravelTIP Server.	$700-800	$700-$800	$8400-$9600
ISDN-PRI connection to handle incoming calls to HAT.	$220-$230	$220-$230	$2640-$2760
A single shared T1 connection to handle web traffic to/from the two web servers.	$600	$600	$7200
		$5700-$6000	**$68,400-$72,000**

The Frame Relay service is provided by Verizon and SBC/PacBell, and the cost does not include a one-time $900 set up fee. TravelTIP's initial Internet service when hosted at NET consisted of a 768 kilobit/second DSL connection. When the system was moved to Caltrans D12, the service was switched to a 144 kilobit/second DSL due to the unavailability of faster services in the geographic area of the TMC. This DSL service was provided by Earthlink for $300 per month, but when Earthlink's service proved to be unreliable, OCTA chose to switch and upgrade to a T1 provided by SBC/PacBell. The T1 line provides much greater bandwidth (800-900 KB/sec) than the DSL connection, and OCTA was able to negotiate a special monthly rate of $600 (the usual monthly rate is $2000). However, the communications upgrade required OCTA to upgrade one router for $4500.

Exhibit 21 – Marginal Annual Utility Costs for Operating TravelTIP

Agency Description	Electricity	Telecommunications	Total
System Administrator (OCTA)	$3573	$68,400-$72,000	$71,973-$75,573
Typical Agency that has a staffed TMC	$0	$0	$0
Typical Non-TMC Agency	$175	$0	$175

4.3.1.3 Office Space

All partner agencies reported that there was no additional financial cost for the space occupied by TravelTIP equipment because there is no specific accounting down to the project or system level.

4.3.2 Maintenance

4.3.2.1 Labor

OCTA has budgeted an additional $40,000 per year for system support. This includes both labor and replacement hardware, but not software upgrades.

4.3.2.2 Replacement Hardware/Software

See 4.3.2.1 above.

5 Institutional Impacts Evaluation

5.1 Impacts to Operations and Maintenance Policies and Procedures

Caltrans District 12 TMC hosts and operates the TravelTIP system with funding from OCTA

After the system had been accepted and NET's O&M period had expired, the system was relocated from the NET offices to the Caltrans District 12 TMC. Although OCTA managed the development of the system, the Caltrans District 12 TMC was selected to host it because of its familiarity with similar technologies and the availability of greater communications bandwidth.

Under the terms of its MOU with OCTA, Caltrans District 12 hosts (provides space, electricity and network connection for) the TravelTIP hardware (application server, web servers, and HAT server) and provides only minor maintenance support (re-booting hardware, if necessary). All other responsibilities, including maintenance and providing the funding for operations (electricity, communications, etc.), rest with the OCTA.

OCTA covers the O&M costs of the Participating Local Agencies

Since limited funding at most of the local partner agencies would have otherwise prohibited their participation in the project, their participation was contingent upon there being no cost to them. Under separate MOUs with each of the individual local partner agencies, OCTA agreed to cover all of the following project-related local agency costs:

- Remote Workstations (hardware and software)
- System installation
- Maintenance
- Data communications costs between RWSs and the TravelTIP Server (eventually located at Caltrans District 12)

5.2 Impacts to Staffing/Skill Levels and Training

Agencies generally do not have enough operations staff or other resources to get the most out of the TravelTIP system.

Although the system allows an agency to monitor traffic conditions, enter traffic event information (e.g., planned maintenance/closure schedules, incident information, etc.), and view similar information from other partner agencies, most of the TravelTIP partner agencies do not have the staff resources to take advantage of this capability. This is particularly true for the region's non-TMC agencies. Most RWSs are left alone to automatically process VDS data and transmit it to the central TravelTIP system for use on the website, HAT and kiosks. Some

agencies make use of summer interns and – in addition to their other tasks – assign these individuals to occasionally enter data into the RWSs.

Operator and system administrator training was provided, but has been somewhat under-minded by staff turnover.

The System Developer provided training as part of the project to help familiarize agency operators/representatives with the system's user interface and features. To accommodate busy schedules, the agency staff were invited to attend one of four 8-hour classes consisting of lecture and hands-on workstation training. Manuals were also provided for participants to keep.

The end of a long project is often viewed as a good time to make career adjustments. Some of the agency staff who participated in the TravelTIP project and associated training sessions have left their agencies for other opportunities. When these changes happen so shortly after a project's completion, there is little or no time to orient others about the new system, and the system has a harder time becoming "institutionalized." Staff replacements often enter the job unaware of the new system's purpose or capabilities.

5.3 Impacts to the Competitive Environment

TravelTIP's system design is non-proprietary, but the system documentation does not provide details regarding Kernel-lite.

At the moment, TravelTIP is not integrated with the Showcase Network (i.e., the Kernel) and relies on an interim design called "Kernel-lite." It is not clear to what extent this system makes use of Showcase's standard IDL. The more deviation there is from this standard IDL, the more effort and expense that would be required by someone other than the system developer to modify the system.

5.4 Impacts to Local Planning Processes, Policy Development, and the Mainstreaming of ITS

TravelTIP helped create both a physical and institutional foundation for further ITS development in Orange County.

The development of TravelTIP puts in place both a physical and institutional foundation for further ITS development in Orange County.

Physically, one of the greatest accomplishments of the Showcase Program is its development of system interface standards for Southern California. Similar to the national effort on NTCIP, adoption of these standards will help promote interoperable systems that enable greater

information sharing, improved agency coordination, and reduced costs over time. Furthermore, the deployment of the regional network and several new agency centers (Remote Workstations) provides a foundation on which functions and services can be tested, analyzed, improved, and added.

Perhaps more importantly, TravelTIP creates an institutional foundation that helps to mainstream ITS in the region. Through the TravelTIP experience, regional partners have had the opportunity to face and resolve critical institutional issues and establish precedents for the region's future ITS projects. Some of these critical issues include, but are not necessarily limited to:

- System and information security
- System reliability
- Policies regarding shared control of field equipment such as CCTVs and CMSs
- Software ownership and the treatment of intellectual property rights
- Delegation of operations and maintenance responsibilities (including funding)

These precedents should help clear the way for future ITS advancements in Orange County.

6 Traveler and Transportation Information Management Evaluation

6.1 Extent of Regional and Interregional Transportation and Traveler Information Integration Between Agencies

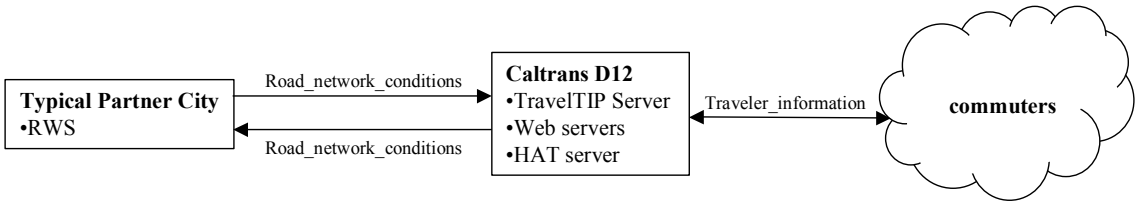
Prior to TravelTIP, there was no interagency integration of transportation management systems in Orange County. TravelTIP lays the foundation for the expanded exchange and use of transportation data among the regional partners.

Prior to TravelTIP, there was no interagency integration of transportation management systems in Orange County. Although TravelTIP is primarily designed to be a regional traveler information system, it lays the foundation for the expanded exchange and use of data among the regional partners.

Exhibit 22 is a simple depiction of the ITS architecture flows implemented by TravelTIP. Although only the "typical partner cities" are represented, additional data of a similar nature is also exchanged with the TMC-equipped agencies of Anaheim, Caltrans District 12, Irvine, and Santa Ana.

Road_network_conditions consisting of VDS data and textual event information are exchanged between the partner agencies and the TravelTIP server. Processed information (*traveler_information*) is disseminated to the traveling public via the TravelTIP website, HAT, and four strategically placed kiosks.

Exhibit 22 – ITS Architecture Flows Implemented by TravelTIP



6.2 Utilization of Regional and Interregional Transportation and Traveler Information by Public Agencies

TravelTIP's partner agencies report that they do not utilize the system at this time.

The 15 partner agencies were contacted to determine the performance and utilization of their TravelTIP systems. Of those partner agencies that responded to the evaluation's inquiry:

- Seven (7) agencies reported that their system has never been operational
- Two (2) agencies reported that it used to be operational, but is not any longer
- One (1) agency wasn't sure because it had not tried to use the system
- Four (4) agencies reported that their system is operational

Those agencies that have functioning systems report that they rarely, if ever, use the system to monitor traffic conditions or input advisories because they are typically under-staffed and usually have higher-priority issues to handle. The systems are usually left to automatically process traffic data (volumes, occupancies, speeds) for the website's color-coded traffic flowmap.

6.3 Extent to which Comprehensive and Seamless Traveler Information is being Disseminated to – and Used by – the Traveling Public

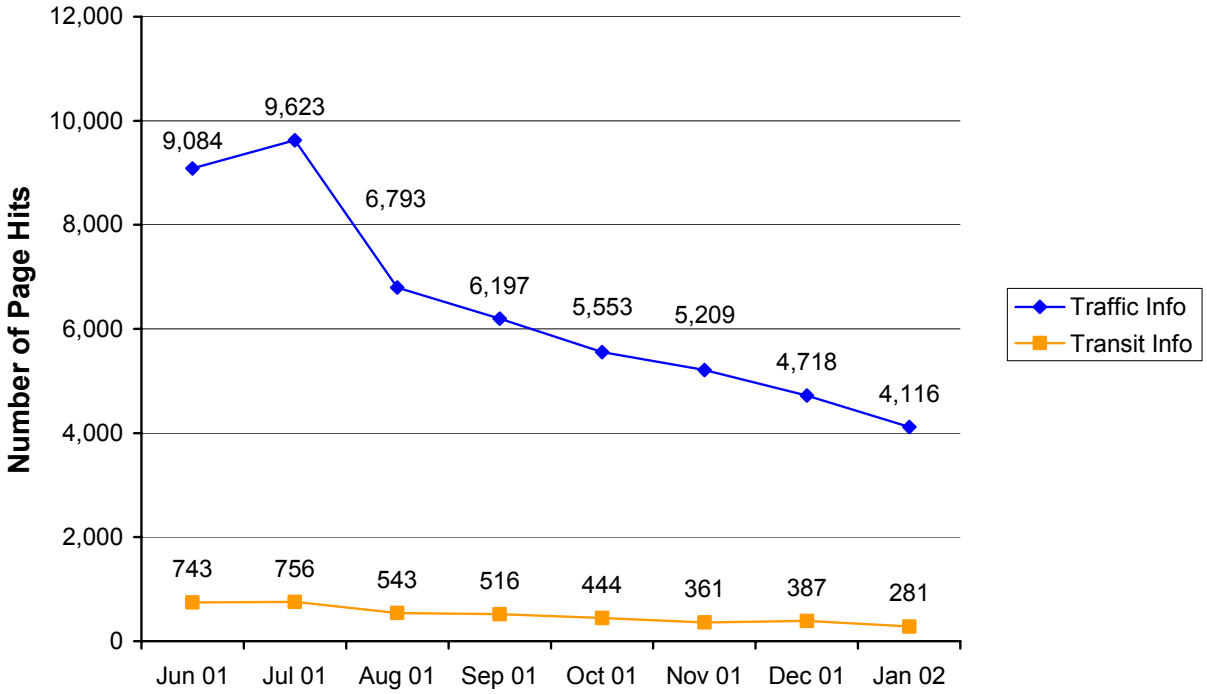
6.3.1 TravelTIP Website

The TravelTIP website received seven times as much use as the HAT, but not enough market penetration to significantly impact traffic conditions.

Data on the public's use of the TravelTIP website is available for the system's eight months of operation immediately following the "media blitz" on June 11, 2001. The usage data is drawn from automatically collected server statistics and is based on the number of web pages requested. These statistics do not necessarily indicate the number of unique users or the number of distinct user sessions. For example, TravelTIP's traffic map refreshes automatically approximately every 60 seconds, and each refreshed page is counted as a new page request or "hit." Idle use of the traffic page as a background or "wallpaper" could result in hundreds of additional page hits.

Exhibit 23 shows the number of monthly page hits to TravelTIP's traffic and transit pages over the eight months following the media blitz on June 11, 2001. As the exhibit shows, use of the site was greatest immediately following the media blitz and decreased rapidly over the following months.

Exhibit 23 – TravelTIP Website Usage, by Month



The June 2001 numbers reflect only 15 days of data, starting from June 11 (data for June 17 and June 27-30 were not available for this report). July 2001 page hits are estimates based on available data.

The average hits-per-month to TravelTIP's Traffic page was 6,412 during the eight-month period, while the average hits-per-month to the Transit page was 504. The resulting ratio of Traffic page hits to Transit page hits is roughly 12.7 to 1. This might be explained by two factors:

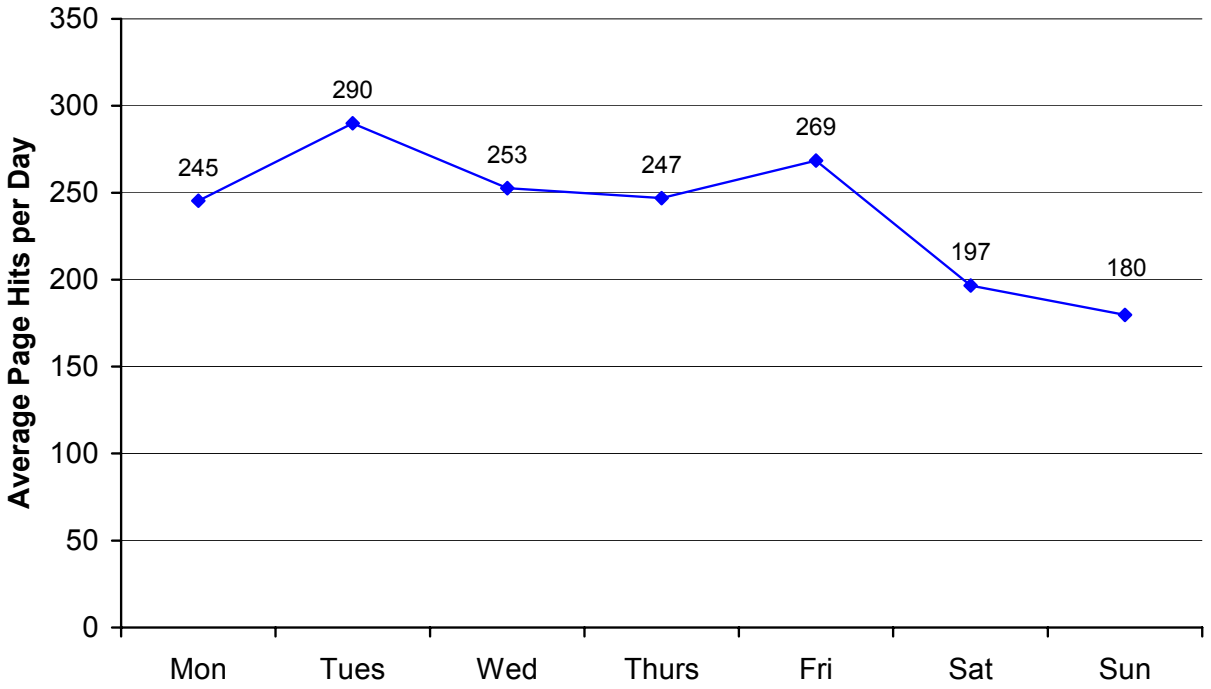
1. TravelTIP's transit page provides a list of links to existing local transit information web sites. Once identified, users can "bookmark" and access these sites directly without using TravelTIP.

2. The vast majority of Orange County commuters travel by automobile, which results in a greater demand for traffic information as compared to transit information.

The average number of TravelTIP page hits per day, including both the traffic and transit pages, was much higher in June and July (daily average of 439) than in the later six months (daily average of 191). In particular, the number of page hits on June 12 (i.e., the day after the media blitz) is estimated at 1,194 – almost five times higher than the overall average daily number of page hits of 241 during the eight-month period.

Exhibit 24 shows the average daily number of page hits, by day of week.

Exhibit 24 – TravelTIP Usage, by Day of Week



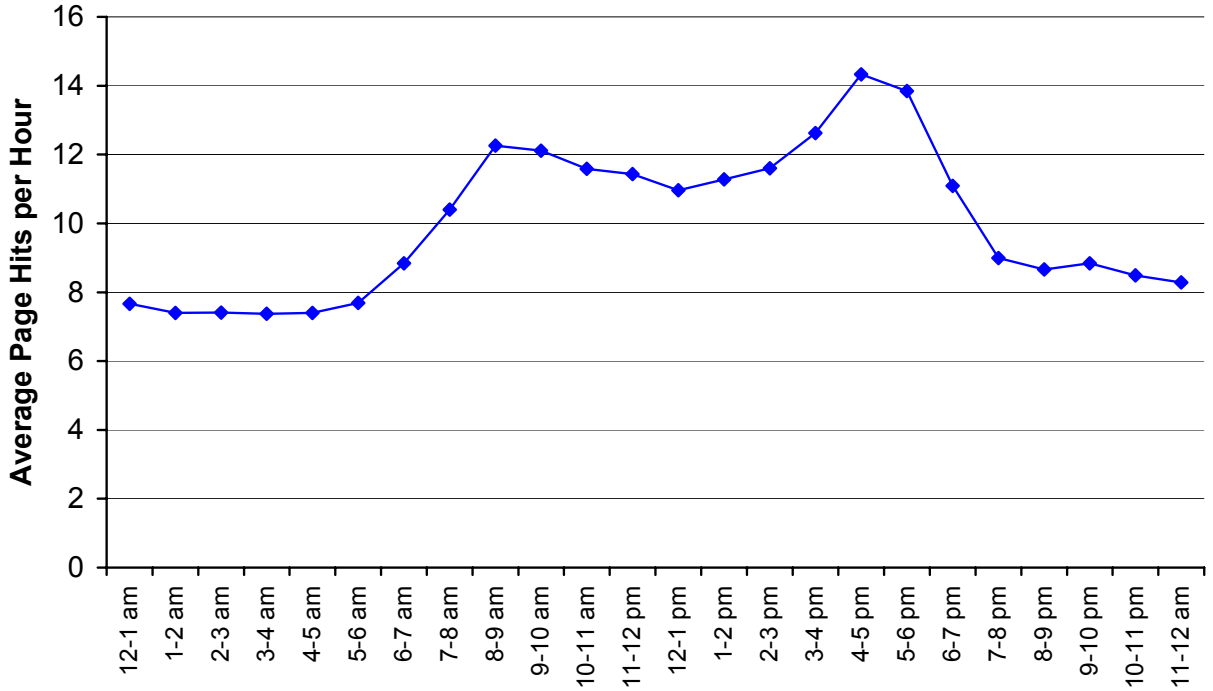
The relative proportions of Traffic page hits versus Transit page hits by day of week were not available.

The day of the week with the highest average usage was Tuesday, followed by Friday. However, it should be noted that June 12, the day after the media blitz, was on a Tuesday. If data for this particular day is removed from the calculation, the average daily number of page hits on Tuesdays was 263 – closer to the average for other weekdays.

The volume of page hits on Mondays through Fridays (average of 261 page hits per day) was about 38.5% higher than the volume on Saturdays and Sundays (average of 188 page hits per day).

Exhibit 25 shows the average hourly number of page hits, by time of day.

Exhibit 25 – TravelTIP Usage, by Time of Day



The relative proportions of Traffic page hits versus Transit page hits by time of day were not available. Different time of day distribution data by day of week was also not available.

The peak times were from 8 am to 10 am in the mornings (average of 12.2 page hits per hour), and from 3 pm to 6 pm in the afternoons (average of 13.6 page hits per hour). Usage was fairly constant from 10 am to 3 pm (average of 11.4 page hits per hour).

6.3.2 TravelTIP Highway Advisory Telephone (HAT) Service

Only summary data regarding the usage of the HAT is available at this time. The system received roughly 900 calls per month.

6.3.3 TravelTIP Traveler Information Usage Summary

Exhibit 26 compares the average daily use of the TravelTIP website and HAT during the eight-month period from June 2001 to January 2002 to that of Smart Traveler and CHIN, two other California-based traveler information systems.

Exhibit 26 – Summary Comparison

System	Average Daily Website Hits (Home Page)	Average Daily Number of Calls
TravelTIP	241	30
Smart Traveler	81	6,250
CHIN	4,029	8,341

Exhibit 26 does not highlight that use of the TravelTIP website went down significantly after July 2001:

- From June 2001 to July 2001, there were an estimated 439 average daily home page hits to the TravelTIP website;
- From August 2001 to January 2002, this number went down to 191.

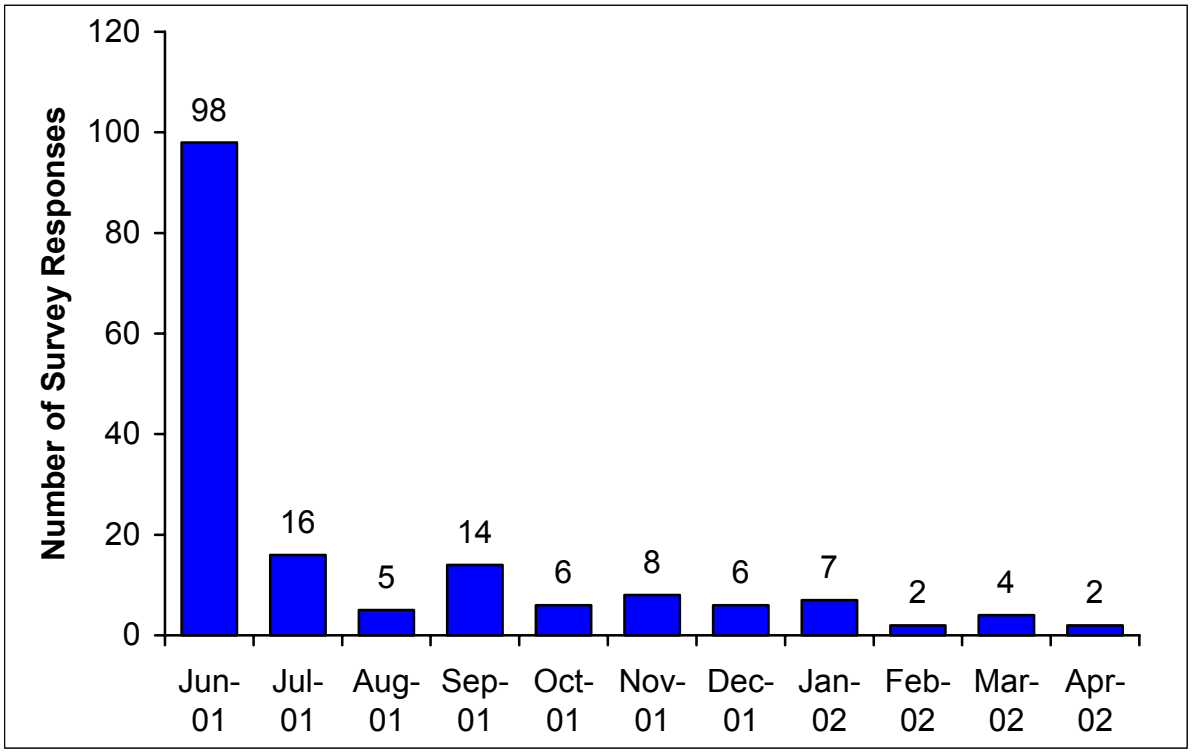
CHIN is clearly the most heavily used of the three systems. Reasons for variations in use among the three systems are likely to include:

- Time in Market – Smart Traveler and CHIN have been operational for several years and have had an opportunity to establish a user base. TravelTIP is relatively new.
- System Functionalities – The Smart Traveler website is primarily a portal to other regional traveler information services, while the CHIN website provides a textual listing of current traffic incidents, closures, etc.
- Geographic Coverage – TravelTIP focuses on the Orange County region, while both Smart Traveler and CHIN are statewide.

7 Transportation System Impacts Evaluation

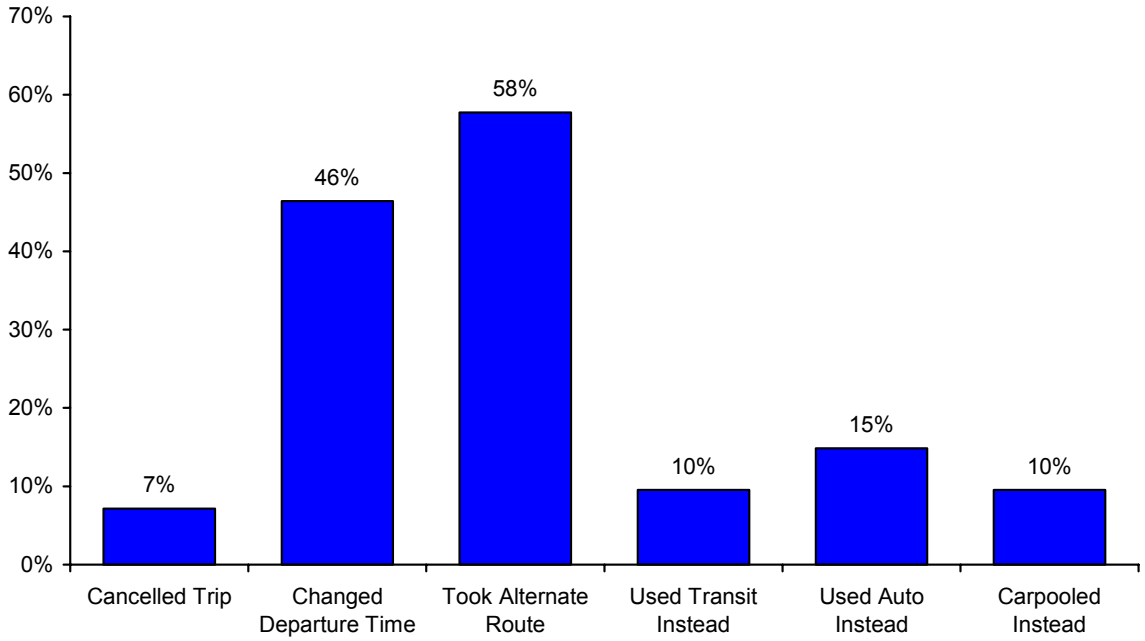
Data contributing to the findings of this study include statistics on system usage, quantitative traffic and transit data, and responses from an online survey. The chart below shows survey responsiveness for each month of data collection.

Exhibit 27 – Number of Survey Responses by Month



When questioned as to what actions they have ever taken as a result of obtaining information from TravelTIP, respondents provided the following feedback:

Exhibit 28 – Actions Ever Taken in Response to TravelTIP Information



37 percent of respondents indicated that they had ever made no change and traveled as planned, in response to TravelTIP's traffic information.

7.1 Impacts to Mode Shifting and Intermodalism

According to Exhibit 28, 10% of respondents reported having used public transit at least once as a result of learning of a traffic incident through TravelTIP. Extrapolating this percentage to all TravelTIP users, this might have resulted in as many as 960 people temporarily shifting to transit.

However, a larger number of respondents (15%) reported having ever switched from using transit to driving an automobile at least once as a result of TravelTIP. This may be indicative of several possible scenarios, including (but not limited to):

- Voluntary transit users (i.e., those who choose to use transit, but also have automobiles and do not necessarily depend on transit) who would rather sit in traffic in their own automobile versus aboard a bus.

- Voluntary transit users who choose to drive so as to depart at a different time or take an alternate route.

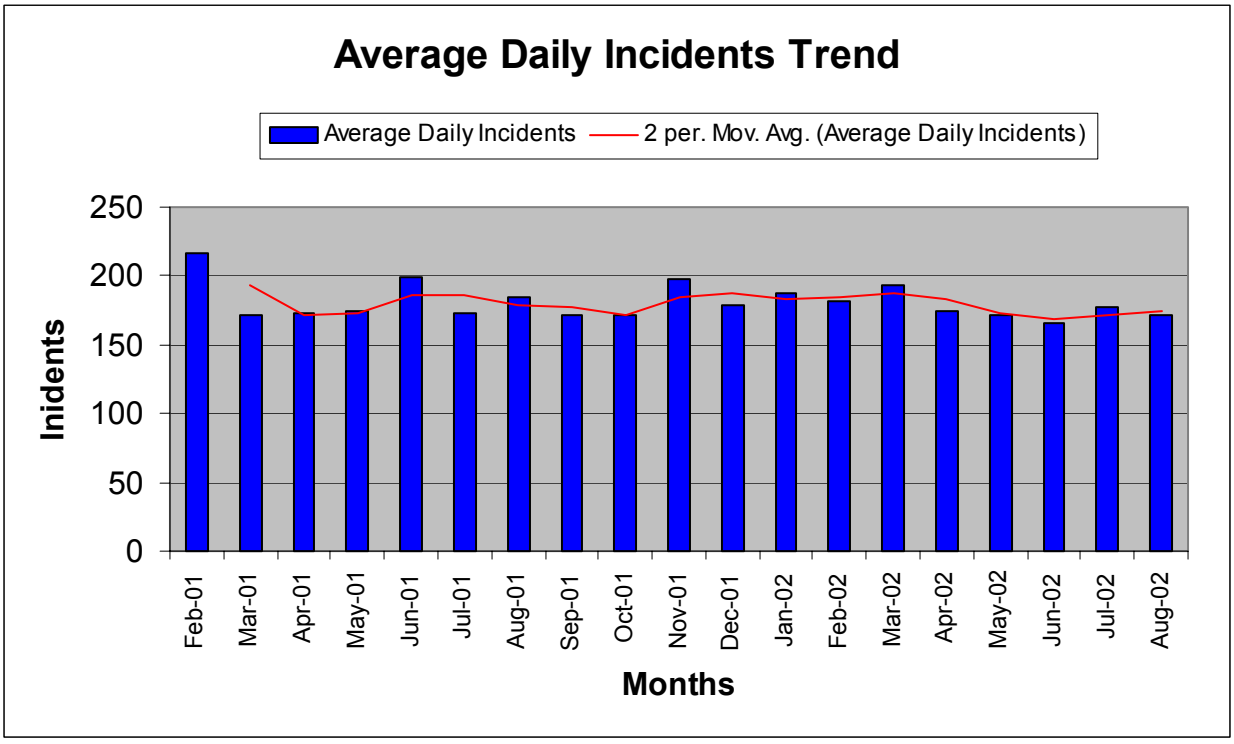
Although switching from public transit to personal automobile may save stress or delay for the individual, the additional vehicle on the road does contribute to overall traffic volume and a reduction in the roadway's level of service.

7.2 Impacts to Traffic Safety and Accident Reduction

TravelTIP's online survey reveals that 61% of respondents use the system to obtain more information regarding accidents that they initially heard about through some other means such as radio, television, or word-of-mouth. In response to this information, respondents are more likely to change their departure time (46%) or take an alternate route (58%).

However, at its current level of market penetration, TravelTIP has not had a significant impact on reducing the number of incidents on Orange County highways and freeways. Exhibit 29 shows that before, during, and after TravelTIP operation the average number of daily incidents remained relatively constant at roughly 175 incidents per day.

Exhibit 29 – Average Daily Incidents in Orange County, February 2001 – August 2002



7.3 Impacts to Traffic Congestion

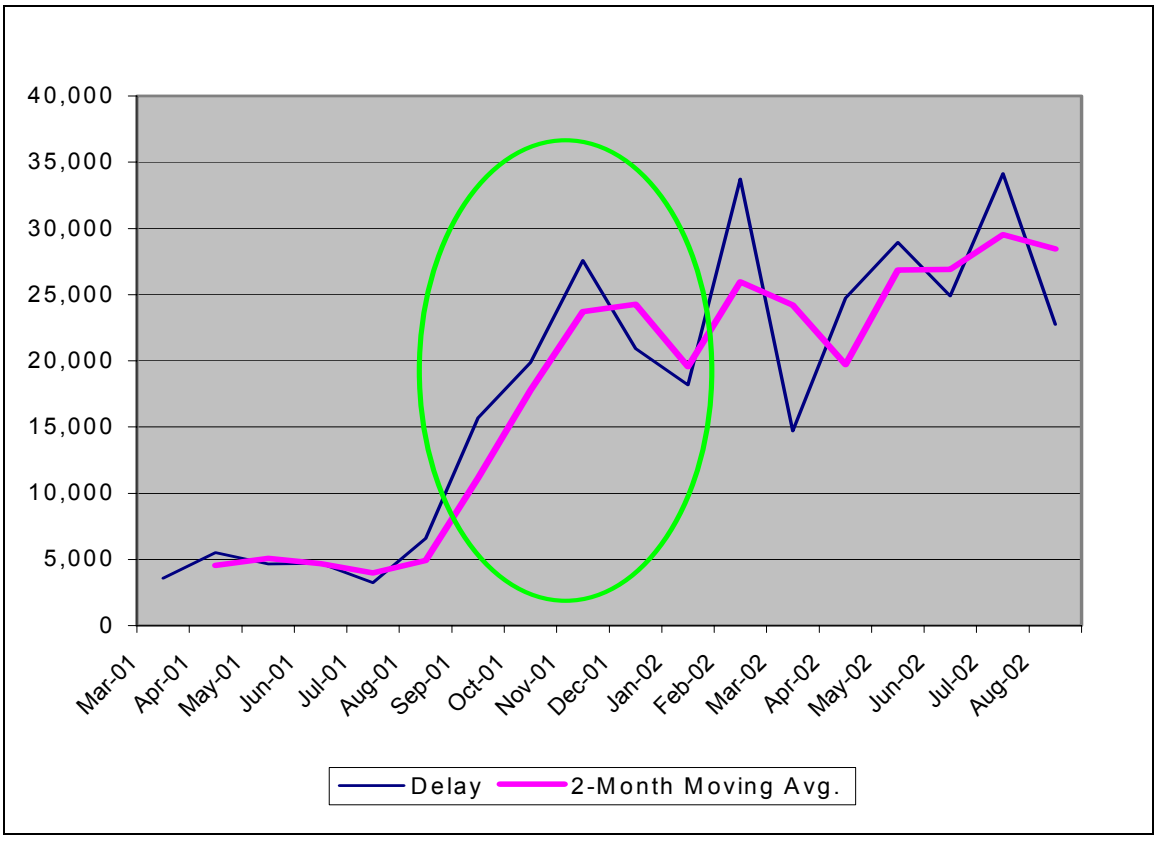
At most, TravelTIP's 261 average weekday 'hits' represent usage by about 0.01% of Orange County's 2.1 million registered drivers. At this level of market penetration, it is not clear what impact the system has had on the region's overall traffic congestion to-date.

A before-and-after analysis of archived traffic data was conducted using California's Highway Performance Measurement System (PeMS). PeMS is the result of a joint effort between Caltrans and the Partnership for Advanced Transportation and Highways (PATH) at UC-Berkeley. The system collects, validates, and archives real-time loop detector data from around the state, and provides access to various analytical tools via a web-enabled interface.

An analysis of the aggregate daily delay on the county's highways and freeways shows gradually increasing delay over the period of May 2001 to August 2002, which includes TravelTIP's operational period (circled). It is not clear why the overall delay shot up so drastically (roughly 500%) during July 2001 – November 2001, or to what extent TravelTIP may have impacted this increase. Further study is required.

Exhibit 30 – Total Hours of Delay per Day on Orange County Highways and Freeways

May 2001 – August 2002



7.4 Impacts to Environmental Effects of Traffic

Although automobile traffic can impact the environment in several ways, this section focuses on TravelTIP's impacts to automobile emissions and air quality. Through the combustion of fossil fuels and air, automobile engines produce carbon monoxide (CO), nitrogen oxides (NOx), and water vapor. In the presence of sunlight, these CO and NOx emissions contribute to the formation of ground level ozone and smog.

The amount of CO and NOx emitted by an automobile engine varies by its age and condition, the amount of load on the engine (whether it is idling or not), and the ambient temperature. The United States Environmental Protection Agency (EPA) publishes average "exhaust emission factors" for engines under various conditions, and these factors can be used to roughly estimate the amount of exhaust emissions produced or mitigated under various scenarios.

Exhibit 31 – Exhaust Emissions Factors in Grams/Mile at Various Vehicle Speeds at Low Altitude and 75°F Ambient Temperature[4]

	2.5MPH (Idle)	35MPH	55MPH	65MPH
Carbon Monoxide (CO)	83.58	9.80	7.45	15.90
Nitrogen Oxides (NOx)	3.14	2.04	2.65	3.51

Consider a scenario in which a vehicle encounters an incident that has caused traffic to back up for one mile. According to the EPA's Exhaust Emissions Factors, that one vehicle would generate roughly 84 grams of CO and just over 3 grams of NOx while inching through the backup at 2.5 MPH. A total traffic standstill would generate even more emissions.

The emissions factors in Exhibit 31 imply certain emissions-related benefits to using traveler information to avoid traffic congestion. These benefits are described in general below. Since there are virtually endless scenarios to consider, the reader is invited to use the information provided in this section to quantify his own specific benefits.

Mitigating Action	Benefit
Change Departure Time	Enables vehicle to travel at higher speed by picking a time when congestion is less severe. Consider a scenario in which an "average" vehicle typically travels 30 miles between home and work, with 7 miles of travel on local streets at 35MPH and 23 miles of travel on freeways at 65MPH. On a typical day, CO output from this trip might be roughly 434.3 grams. However, a one-mile delay (travel at 2.5MPH) on the arterial portion of the trip would inflate the total CO production to 508.08 grams, while a one-mile delay on the freeway portion would result in the production of 501.98 grams. Under this scenario, each vehicle that avoids the traffic congestion could avoid producing as much as 17% greater CO emissions.
Cancel Trip	At best, canceling the trip means that no emissions are generated. At worst, the emissions that would have been generated during the trip are simply deferred to another time.

Take Alternate Route	Since the amount of CO produced at idle is so much more than that produced at higher vehicle speeds, a vehicle could take an alternate route that is longer than the normal route taken and still produce less total exhaust emissions in the process. Using the scenario above, this vehicle could travel up to twice as far on an alternate set of arterials, or roughly 20% farther on an alternate set of freeways.
Take Transit/Carpool	One less vehicle on the road means that much fewer emissions generated. The fewer the vehicles on the road, the higher the travel speeds, which can also reduce emissions further.

7.5 Impacts on Transit Operations

OCTA enacted a major service change in September 2000, rendering the bus ridership data that had been collected by the evaluation up to that point useless for determining a before-after impact. However, additional data collected during the online survey indicates that much fewer users visited TravelTIP for transit information than for traffic information. Of the survey's 170 respondents, 40 (or 24%) reported using TravelTIP's transit page as compared to the 169 (99%) who reported using the traffic page. One reason for this may be because TravelTIP's transit page simply provides links to existing route and schedule information on other websites (an economical approach that avoided "reinventing the wheel"). Users interested only in transit information can simply "bookmark" those other sites and return to them directly without having to go through TravelTIP.

Traffic	Transit	Count	Percent
No	Yes	1	1%
Yes	No	130	76%
Yes	Yes	39	23%
Total		**170**	**100%**

Exclusions: 1 respondent checked 'no' for both traffic and transit.

8 Conclusions and Recommendations

TravelTIP was designed to provide a unique and ubiquitous traveler information service. It is one of the first traveler information systems to provide traffic conditions on surface streets in addition to highways and freeways, and its geographic coverage includes almost all of Orange County.

Many of the conclusions of this evaluation are limited to general findings because the TravelTIP system has not yet reached full and continuous operation. TravelTIP's implementation was complicated and delayed by the concurrent development of other Showcase infrastructure (namely the Showcase Kernel), as well as interruptions due to facility and legacy system improvements by some of the local partner agencies during the project. Although the system was partially operational while being hosted by its developer, National Engineering Technology (NET), network security settings at the Caltrans District 12 Transportation Management Center (TMC) have been hampering the operation of the TravelTIP Server since roughly March 2002. The evaluation recommends that OCTA consider relocating the TravelTIP servers out of the Caltrans District 12 TMC to a private, third-party service provider that specializes in hosting, operating and maintaining web servers. The TravelTIP system worked well while it was hosted by NET, and the Orange County Model Deployment Initiative (OCMDI) project has also had success using third-party service providers for this purpose.

OCTA covers all of TravelTIP's operations cost on behalf of its partner agencies, which could not otherwise afford to participate. The total annual operating cost for TravelTIP is $72,000-$75,000, with leased telecommunications service being the primary cost contributor. OCTA also budgets an additional $40,000 per year for maintenance labor costs.

Although TravelTIP provides the capability for partner agencies to input textual traffic advisories, most cannot take advantage of this feature due to a lack of human resources. Most local traffic departments are short on staff and cannot spare the time to enter such advisories. Some jurisdictions utilize student interns for this task. The evaluation recommends that other agencies contemplating similar ITS projects should first develop a detailed Concept of Operations (Con Ops) that considers operator workloads and the procedural responsibilities of the individual partners. Development of the ConOps may reveal a requirement that the system be as automated and "hands free" as possible.

Thanks to a strategic marketing campaign in June 2001, TravelTIP received relatively good usage at the beginning. From June 2001 to July 2001, there were an estimated 439 average daily page hits to the TravelTIP website. During August 2001 to January 2002, this number dropped to 191 average daily hits, resulting in an eight-month average of 241 daily hits. The table below compares the average daily use of the TravelTIP website and HAT service to that of Smart Traveler and CHIN, during the eight-month period from June 2001 to January 2002.

System	Average Daily Website Hits (Home Page)	Average Daily Number of Calls
TravelTIP	241	30
SmartTraveler	81	6,250
CHIN	4,029	8,341

CHIN is clearly the most heavily used of the three systems. Possible reasons for the variation in use among the three systems include time-in-market, marketing, system functionalities, and geographic coverage. For example, CHIN and SmartTraveler have been in operation for several years and have statewide coverage, while TravelTIP is new and focuses on the Orange County region.

Greater market penetration is required, however, before TravelTIP should be expected to produce significant transportation system impacts. At its current level of use, TravelTIP reaches roughly 0.01% of Orange County's 2.1 million registered drivers on a daily basis.

When asked what they do with the traveler information, TravelTIP users who responded to the evaluation's online survey reported that they most often take alternate routes (58% of respondents) or change their departure time (46%). This may result in greater vehicle-miles-traveled (VMT) as drivers go out of their way to avoid incidents or plan additional stops and run errands while waiting for congestion to clear. Far fewer respondents reported switching mode to transit (10%) or carpooling (10%).

Lastly, but perhaps more importantly, the development of TravelTIP put in place both a physical and institutional foundation for further ITS development in Orange County. TravelTIP was instrumental in helping to develop system interface standards for ITS in Southern California. Similar to the national effort on NTCIP, adoption of these standards will help promote interoperable systems that enable greater information sharing, improved agency coordination, and reduced costs over time. Furthermore, the deployment of a regional network and several new agency centers (Remote Workstations) provides a foundation on which functions and services can be tested, analyzed, improved, and added.

TravelTIP also creates an institutional foundation that helps to mainstream ITS in the region. Through the TravelTIP experience, regional partners have had the opportunity to face and resolve critical institutional issues and establish precedents for the region's future ITS projects. These precedents should help clear the way for future ITS advancements in Orange County.

Appendix A – TravelTIP Partner Agencies

TravelTIP receives traffic data from Caltrans District 12 and 15 of the 34 incorporated jurisdictions within Orange County. The table below provides information regarding the participation of each, including what transportation data the agency provides and what level of staff support the system gets. Explanations of the column headings follow the table.

Agency (POC)	Provides Data			Receives Data	Operator Assigned	Operating
	VDS	Advisories	Transit Info.			
Anaheim (John Thai)	TMC/ ATMS	yes	none	yes	c	
Brea (Warren Siecke)	VMS-330	yes	none	yes	na	
Buena Park (Jim Otterson)	VMS-330	yes	none	yes	o	
Caltrans D12 (Ed Khosravi)	ATMS 2.0	yes	none	yes	c	yes
Costa Mesa (David Sorge)	VMS-330	yes	none	yes	o	
Fountain Valley (Jose Alire)	VMS-330	yes	none	yes	o	yes
Fullerton (Dave Langstaff)	VMS-330	yes	none	yes	o	
Garden Grove (George Allen)	VMS-330	yes	none	yes	c	
Huntington Beach (Bob Hidusky)	none	yes	none	yes	o	
Irvine (Chau Nguyen)	TMC/ ATMS	yes	none	yes	o	
Mission Viejo (Shirley Land)	VMS-330	yes	none	yes	o	yes
Newport Beach (Antony Brine)	VMS-330	yes	none	yes	o	
OCTA (Dean Delgado)	None	yes	planned	yes	a	
Orange (city) (Dennis Schmitz)	VMS-330	yes	none	yes	o	
Santa Ana (T.C. Sutaria)	TMC/ ATMS	yes	none	yes	c/o	
Tustin (Doug Anderson)	Econolite	yes	none	yes	a	yes
Westminster (Peter Mackprang)	VMS-330	yes	none	yes	o	

VDS – the agency's source of traffic sensor data, such as a centralized traffic signal control system or an ATMS.

Advisories – textual advisories regarding incidents, roadway debris, etc.

Transit Info. – As of February 2002, no partner is providing transit information via TravelTIP, although OCTA does have plans to provide real-time bus schedule/status information in the future.

Receives Data – Some systems were designed to send and receive information, while others were designed only to send data. This column indicates which, if any, of the TravelTIP partners receive data as well as send it.

Operator Assigned – Indicates the anticipated level of staffing at each agency and how each one intends to use TravelTIP's capabilities. An explanation of the codes follows.

Code	Definition
c	An attendant will continuously monitor the workstation during normal work hours.
o	The workstation will be monitored occasionally - only as required or as staff availability permits.
c/o	The workstation will be continuously monitored during peak periods; only occasionally otherwise.
a	The workstation will be left to operate autonomously and without much user interaction.
na	Information not available. The agency either did not know or did not respond to our inquiry.

Operating – Indicates which agencies were online and providing data as of the writing of this report.

Appendix B – TravelTIP Website Reliability and Availability Log

Date	Time	Condition/Status
6/11/2001		TravelTIP holds webcast with five agencies providing data (Caltrans D12, Costa Mesa, Fountain Valley, Mission Viejo, Tustin)
2/25/2002		Beginning in the afternoon, the website is available but there is no data. The HAT is also offline and repeated calls are answered with a busy signal.
2/26/2002	12:00pm	The website is still available, but there is no data. The roadways are not color-coded and there are no advisories. The HAT continues to return a busy signal.
3/1/2002	12:32pm	The color-coded traffic flow map is functioning again. Data appears to be coming from Caltrans D12, Costa Mesa, and Fountain Valley. Response times for zooming and panning the map are both 2-4 seconds. The HAT still yields a busy signal.
3/4/2002		The website is operational, but the HAT continues to yield a busy signal.
3/6/2002	9:15am	The website is available, but the traffic map does not load. The HAT continues to yield a busy signal.
3/7/2002	2:11pm	The traffic map on the website loads, but there is no Caltrans data available. Zooming down to the arterial level shows that data is available from Fountain Valley and Costa Mesa. The HAT continues to yield a busy signal. By 3:43pm, Caltrans data was back online.
3/13/2002	10:40am	The traffic map is available, and there is data from Caltrans and Fountain Valley. Costa Mesa appears to be offline again. The HAT continues to yield a busy signal.
3/14/2002	4:43pm	The website is available, but the traffic map does not load. The HAT continues to yield a busy signal.
3/19/2002	4:21pm	The traffic map on the website loads, but there is no Caltrans data available. Zooming down to the arterial level shows that no data is available from the local cities either. The HAT continues to yield a busy signal.
3/20/2002	8:06am	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities. The HAT continues to yield a busy signal.
3/20/2002	8:52am	The traffic map is no longer available. Instead, users see the message, "Sorry Service Not Available, Try Later." The HAT continues to yield a busy signal.
4/1/2002	3:17pm	The website is blank except for the words "MindSpring Web Services."
4/22/2002	2:00pm	After being completely down for 33 days, the TravelTIP website appeared partially operational today. The site is available, but the traffic flowmap does not load.
4/23/2002	12:00pm	The TravelTIP website is partially operational today. The site is available, but the traffic flowmap does not load.
4/24/2002	9:00am	The TravelTIP website is partially operational today. The site is available, but the traffic flowmap does not load.
4/25/2002	3:55pm	The TravelTIP website is partially operational today. The site is available, but the traffic flowmap does not load.
4/26/2002	10:30am	The TravelTIP website is partially operational today. The site is available, but the traffic flowmap does not load.
5/2/2002	3:43pm	The TravelTIP website is partially operational today. The site is available, but the traffic flowmap does not load.

Date	Time	Condition/Status
5/7/2002	11:53am	The TravelTIP website is partially operational today. The site is available, but the traffic flowmap does not load.
5/10/2002	8:54am	TravelTIP's traffic flowmap is back online, but only displays Caltrans D12 highway data. There is no data for the arterials.
5/13/2002	11:02am	TravelTIP's traffic flowmap is online, but only displays Caltrans D12 highway data. There is no data for the arterials.
5/14/2002	9:30am	TravelTIP's traffic flowmap is online, but only displays Caltrans D12 highway data. There is no data for the arterials.
5/17/2002	10:36am	TravelTIP's traffic flowmap is online, but only displays Caltrans D12 highway data. There is no data for the arterials.
5/20/2002	8:30am	TravelTIP's traffic flowmap is online, but only displays Caltrans D12 highway data. There is no data for the arterials.
5/28/2002	3:30pm	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
5/29/2002	9:36am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
6/11/2002	8:34am	The website is not available. Traveltip.net returns a DNS error.
6/12/2002	1:33pm	The website is not available. Traveltip.net returns a DNS error.
6/13/2002	1:58pm	The website is not available. Traveltip.net returns a DNS error.
6/14/2002	9:39am	The website is not available. Traveltip.net returns a DNS error.
6/17/2002	11:30am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
7/3/2002	2:05pm	The website is not available. Traveltip.net returns a DNS error.
7/8/2002	11:30am	The website is not available. Traveltip.net returns a DNS error.
7/10/2002	10:27am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
7/11/2002	9:02am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
7/12/2002	11:41am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
7/15/2002	1:18pm	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
7/18/2002	12:03pm	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County. The County's data covers major arterials in southern Orange County around Lake Forest, Laguna Hills, etc.
7/29/2002	9:05am	The website is not available. Traveltip.net returns a DNS error.
7/30/2002	1:17pm	The website is not available. Traveltip.net returns a DNS error.

Date	Time	Condition/Status
7/31/2002	1:32pm	The website is not available. Traveltip.net returns a DNS error.
8/1/2002	4:53pm	The website is not available. Traveltip.net returns a DNS error.
8/2/2002	2:37pm	The website is not available. Traveltip.net returns a DNS error.
8/4/2002	11:05am	The website is not available. Traveltip.net returns a DNS error.
8/5/2002	10:15am	The website is not available. Traveltip.net returns a DNS error.
8/6/2002	4:32pm	The website is not available. Traveltip.net returns a DNS error.
8/7/2002	9:10am	The website is not available. Traveltip.net returns a DNS error.
8/8/2002	4:15pm	The website is not available. Traveltip.net returns a DNS error.
8/9/2002	12:43pm	The website is not available. Traveltip.net returns a DNS error.
8/12/2002	10:27am	The website is not available. Traveltip.net returns a DNS error.
8/13/2002	2:02pm	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County.
8/14/2002	11:30am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County.
8/26/2002	10:51am	TravelTIP's traffic flowmap is online and displays highway data from Caltrans D12 and arterial data from the County.
8/27/2002	2:30pm	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
9/4/2002	11:23am	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
9/16/2002	10:26am	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
9/25/2002	10:57am	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
9/26/2002	12:23pm	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
9/27/2002	1:59pm	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
9/30/2002	11:00am	The traffic map on the website loads, but there is no data from Caltrans or any of the local cities.
10/29/2002	4:19pm	The website is not available. Traveltip.net returns a DNS error.

Appendix C – TravelTIP Institutional Issues Questionnaire

The TravelTIP questionnaire is organized by evaluation measure, and each measure has one or more supporting questions that were asked of the representative(s) of the indicated agency(s). Only questions associated with Goal 3, Institutional Impacts, are listed here.

Measure 3.1.1 (Changes in O&M procedures/policies)

OCTA/Caltrans/partner agencies

1. How have your operations (traffic or transit management) policies and procedures changed in response to having TravelTIP?

   Operations

   a) Have you changed your agency's/TMC's/dispatch center's hours of operation to accommodate TravelTIP?

   b) Have you discontinued any tasks or activities that you used to perform because of TravelTIP?

   c) Has TravelTIP impacted how you deal, communicate or coordinate with other agencies (such as local traffic departments, transit providers, police, media, ISPs, etc.)?

   d) Has TravelTIP impacted how other agencies (such as local traffic departments, transit providers, police, media, ISPs, etc.) deal, communicate or coordinate with you?

   Maintenance

   a) For how much of the TravelTIP system are your maintenance staff responsible (workstation hardware/telecommunications connection/software)?

   b) Did your maintenance staff require any special hardware or software training for TravelTIP?

   c) Did TravelTIP replace any legacy systems that you no longer need to maintain?

2. Is TravelTIP an integral part of your traffic/transit management strategy?
   a) Do you make any traffic/transit management decisions based on TravelTIP information?

3. Are there any other ways in which TravelTIP has impacted your agency's operations?

Measure 3.2.1 (Staff changes)

OCTA/Caltrans/partner agencies

1. Were any staff hired (either directly or under contract), fired, or reassigned as a result of TravelTIP? If so, how many?

Measure 3.2.2 (Number of hours of staff training)

See Measure 1.2.5

Measure 3.2.3 (Job classifications created/deleted)

OCTA/Caltrans/partner agencies

1. Has TravelTIP impacted the job titles, responsibilities and/or pay of any of your operations staff members?

Measure 3.2.4 (Change in employee turnover rate)

OCTA/partner agencies

1. Has TravelTIP impacted your employee turnover rate?

Measure 3.3.1 (Ratio of qualified to responsive proposals)

OCTA/Caltrans/SCAG

1. How many proposals were received during the procurement? How many were of sufficient quality to possibly do the work?

Measure 3.3.2 (Magnitude of schedule & cost variation during TravelTIP and compared to similar projects elsewhere)

→ see schedules and contracts on file

Measure 3.3.3 (Number of ITS standards implemented)

NET (system developer)

1. Were any ITS standards implemented in TravelTIP?

Measure 3.3.4 (Number of different firms selected for system development contracts)

→ can obtain this data without an interview

Measure 3.4.1 (NA)

Measure 3.4.2 (NA)

Measure 3.5.1 (Impact of Showcase on local planning)

OCTA/SCAG/Caltrans

1. Was a TravelTIP-like system (it may not have been called TravelTIP at the time) originally called for in the Regional Transportation Plan? If not, has it been added to the plan? Explain.

2. Has either support or expansion of TravelTIP been included into state or local improvement plans?

3. As far as you are aware, have any other public plans been modified as a result of either TravelTIP or Showcase? Explain.

4. As far as you are aware, has the execution of any other plans been temporarily or permanently postponed as a result of either TravelTIP or Showcase? Explain.

5. Has an effort been made to inform other planners and policy makers - who may not know about TravelTIP or Showcase - about the projects? Explain.

6. Did you forego any other transportation improvements in order to fund your agency's involvement in either TravelTIP or Showcase? Explain.

7. Equipment was installed at your agency as a result of TravelTIP/Showcase. Is there anyone at your agency who is responsible for maintaining an inventory or architecture of that installation?

8. Were any policies (such as procurement policies, business plans, operations policies, etc.) within your organization enacted, revised or dropped as a result of either TravelTIP or Showcase?

Measure 3.5.2 (Impact of both public and private sector policy decisions on Showcase projects)

OCTA/SCAG/Caltrans

1. Who sets the policy with regards to TravelTIP and/or traveler information systems?

2. Are there, or have there been, any policies that impact the use, marketing, operation, maintenance, or expandability of TravelTIP?

Appendix D – TravelTIP Website User Survey Results

Survey Design

The TravelTIP User Survey was administered online, and was made accessible to TravelTIP users via an Internet hotlink from the TravelTIP traveler information website (www.traveltip.net). The survey is composed of four survey pages, with each page representing a particular category of questions:

General – The General page asks questions about the respondent's age, gender, computer speed, commute distance, commute time, schedule flexibility, and availability of alternative travel routes. There are also questions about how the respondent first found out about TravelTIP, and his/her typical uses of TravelTIP. Based on how the respondent uses TravelTIP, each respondent is then taken, in sequence, through one or more of the remaining three pages of questions that they indicated are relevant.

Traffic – The Traffic page asks questions that are specific to TravelTIP's traffic information page, illustrated in Exhibit 1, which contains a color-coded traffic speed and flow map (for both freeways and arterials), incident listings, and the locations of major transportation facilities. Respondents were asked about the accuracy, usefulness, and convenience of the traffic information provided.

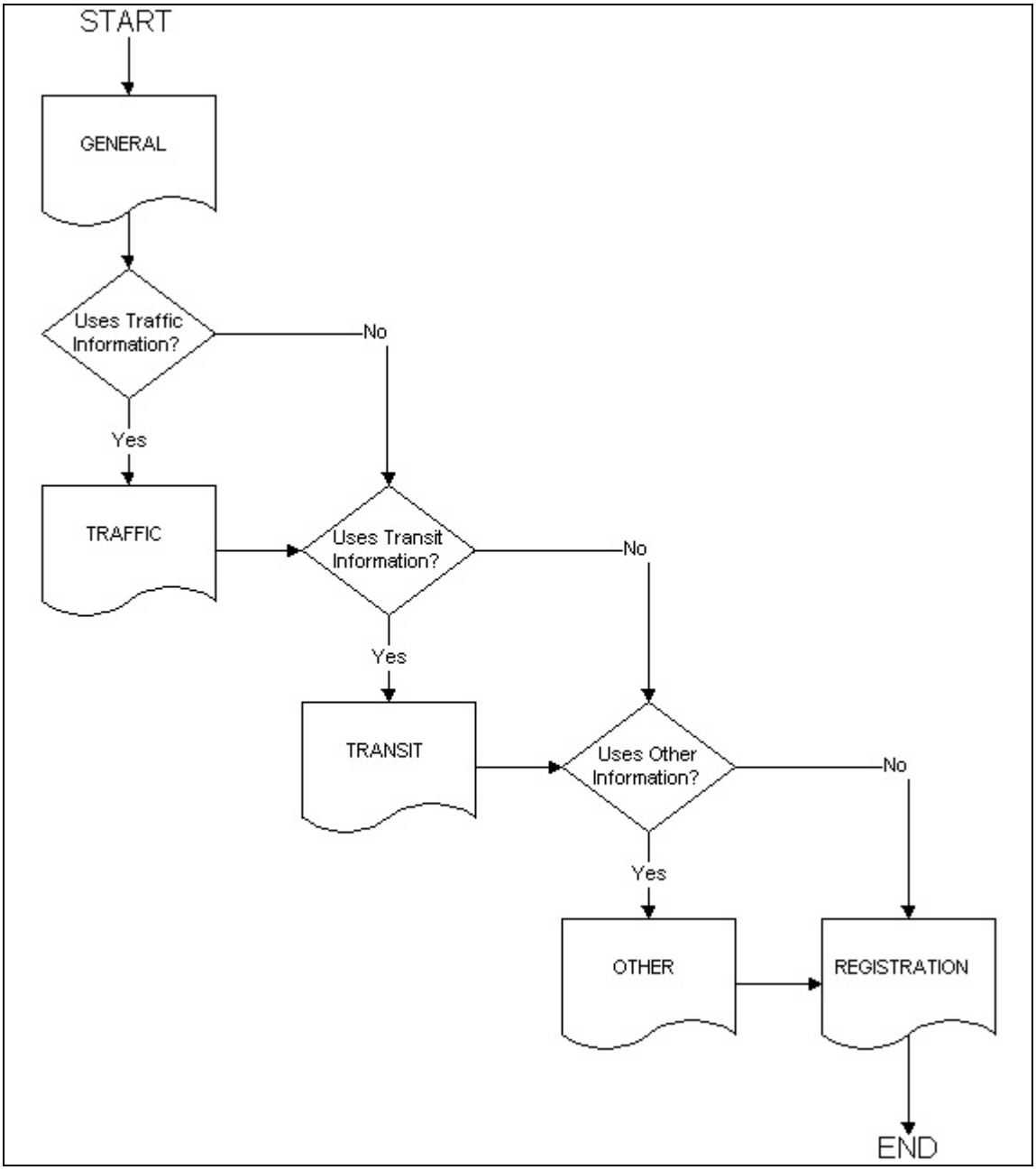
Transit – The Transit page asks users about their perceptions of TravelTIP's transit information page, shown in Exhibit 2, which provided an organized list of hotlinks to the websites of transit providers throughout Orange County and Los Angeles County. These websites generally contain transit route maps, transit schedules, and transit fares, as well as trip planning tools.

Other – The Other page asks users about their perceptions of the "Other" traveler information page, which was employed in the initial version of TravelTIP to provide information about bikeways and other alternative modes of transportation. Note that the website design was subsequently changed after its initial release, and the Other page was dropped. As such, the survey results contained in this report do not present findings pertaining to the Other page.

Registration – A Registration page was used to collect contact information and to validate entries for the prize drawing (see Section 3). All respondents completed the survey on this page and were then redirected back to the TravelTIP home page.

The design and flow of the TravelTIP user survey is graphically depicted in Exhibit 3.

Exhibit D1 – Flowchart Depicting the Design of the TravelTIP User Survey



This design helped ensure that users who visited TravelTIP for a particular type of information (e.g., traffic information) were only asked questions that were relevant to their use of the site. This made the survey process more efficient and helped improve the quality of the responses.

The survey contained mostly structured, multiple-choice questions in which the respondents simply selected the most appropriate response. Large text boxes were also provided on each survey page for respondents to submit any additional comments or suggestions not otherwise addressed.

Survey Period of Operation

The User Survey was first made available to TravelTIP users at the website's "media blitz" on June 11, 2001. The survey ran continuously for roughly ten months, although access to the survey website may have been disrupted during six weeks in February-March 2002 when the TravelTIP website was down. The survey was terminated at the end of April 2002.

Prize Incentive

Since the survey relied on voluntary responses, a prize-drawing incentive package was offered to help boost the response rate. Furthermore, since "self-selective" surveys such as this also tend to receive a disproportionate number of negative responses, the incentive was also intended to help "level the playing field". All qualified respondents (i.e., residents of Southern California) who completed a survey and filled in the registration page at the end were entered into a prize drawing to receive four general admission tickets to a California theme park of the winner's choice. The drawing was held through October 2001, at which time a winner was selected and the prize awarded. No prize incentive was offered from November 2001 to the survey's termination in April 2002.

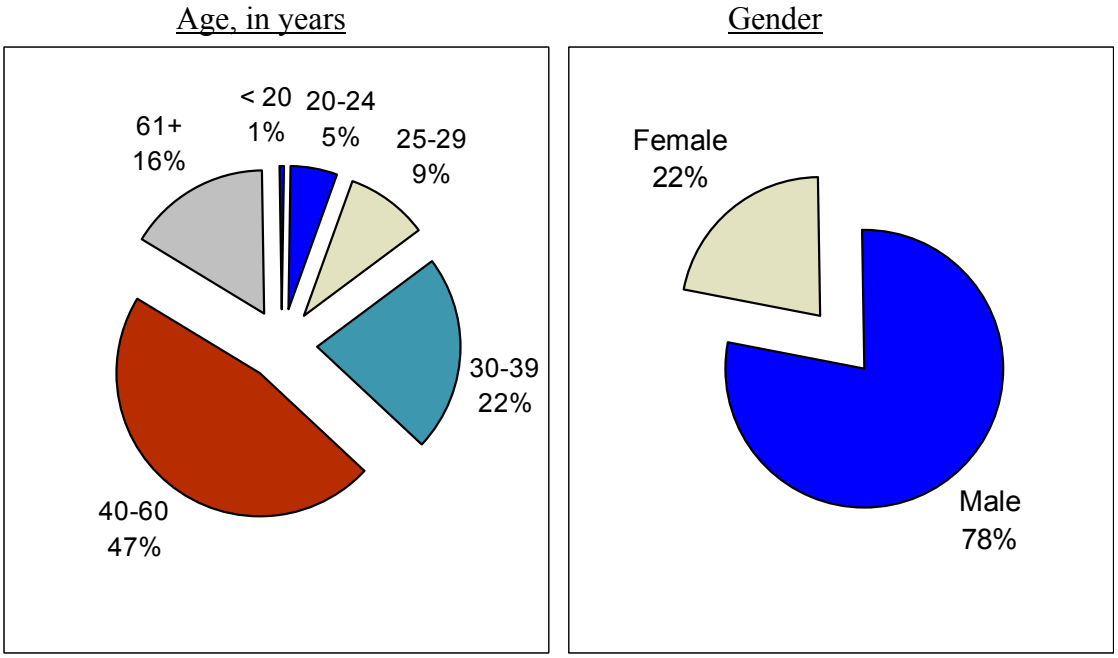
Sources of Bias

The results and feedback presented in this document represent the views of those users who volunteered to take the survey, and so do not necessarily reflect the general views, habits or behaviors of all TravelTIP users. In addition, about 80 (or 47 percent) of the survey's 171 respondents are thought to be from local media representatives who participated in TravelTIP's one-day "media blitz" in June 2001. Their responses are expected to be generally favorable, supportive and "upbeat".

Survey Results

Survey Findings – General (total of 171 respondents)

G1-G2. Age and Gender of TravelTIP Users.



Exclusions: 1 respondent did not provide an age; 1 respondent did not provide a gender.

The largest age category was the 40-60 age group, followed by the 30-39 age group.

Male respondents outnumbered female respondents by a ratio of more than 3 to 1 (132 males to 38 females). The age distribution of male respondents versus female respondents was similar.

G3. Computer Speed.

MHz	Count	Percent
Less than 200	2	1%
200 to 349	22	15%
350 to 499	31	22%
500 to 750	45	31%
Over 750	44	31%
Total	**144**	**100%**

Exclusions: 27 respondents did not know or did not provide their computer speed.

Among the respondents who indicated their computer speed, 62 percent have a computer speed of 500 MHz or greater.

G4. Internet Connection Speed.

Kilobytes per sec	Count	Percent
28.8	1	1%
33.6	6	4%
56	46	29%
Over 56 (LAN, cable modem, or DSL)	107	67%
Total	**160**	**100%**

Exclusions: 11 respondents did not know or did not provide their Internet connection speed.

Among the respondents who indicated their Internet connection speed, about two-thirds use a LAN, cable modem, or DSL connection.

G5. Communications Technology.

Cell Phone?	PDA?	Pager?	Count	Percent
No	No	No	33	19%
No	No	Yes	3	2%
No	Yes	No	2	1%
No	Yes	Yes	1	1%
Yes	No	No	75	44%
Yes	No	Yes	15	9%
Yes	Yes	No	26	15%
Yes	Yes	Yes	16	9%
Total			**171**	**100%**

A total of:

- 132 respondents (77 percent) carry a cell phone on a regular basis;
- 45 respondents (26 percent) carry a Personal Digital Assistant (PDA), such as a Palm Pilot;
- 35 respondents (20 percent) carry a pager.

Thirty-three of the 171 respondents (19 percent) do not carry any of these three items on a regular basis.

G6. Commute Distance.

Commute Distance, One-Way (in miles)	Count	Percent
1 to 5	19	11%
6 to 10	24	14%
11 to 15	22	13%
16 to 20	17	10%
21 to 25	17	10%
26 to 30	18	11%
Over 30	34	20%
Work at home	11	7%
Varies	7	4%
Total	**169**	**100%**

Exclusions: 2 respondents did not know or did not provide their average commute distance.

About 25 percent of respondents have a one-way commute distance of 10 miles or less, while about 20 percent of respondents have a one-way commute of more than 30 miles. Eleven respondents (7 percent) work from home. Seven respondents (4 percent) indicated that their commute distance varies greatly because they go to various job sites.

Respondents from age 40 to 60 were the most likely to have a commute distance of more than 30 miles (27 percent, as compared to 15 percent for the other age groups).

Respondents of over age 60 were the most likely to work at home (27 percent, as compared to 3 percent for the other age groups).

Female respondents were more likely to have a commute distance of more than 30 miles (30 percent, as compared to 18 percent for males).

About 8 percent of female respondents work at home, as compared to 6 percent of male respondents.

G7. Alternative Routes.

Frequency of Use for Alternative Routes	Count	Percent
Daily	27	16%
Weekly	47	28%
Monthly	12	7%
Rarely	62	37%
Don't Use Alternatives	9	5%
No Alternatives Available	10	6%
Total	**167**	**100%**

Exclusions: 4 respondents did not know or did not provide this information.

About 16 percent of respondents indicated they take alternative routes to get to work or school on nearly a daily basis. On the other extreme, about 48 percent of respondents rarely use alternative routes (i.e., less than once a month), never use alternative routes, or have no alternative routes available.

There was no relationship between the commute distance and the frequency of use for alternative routes:

- 36 of the 82 respondents (44 percent) with a one-way commute of 20 miles or less indicated they use alternative routes on a daily or weekly basis;
- 31 of the 69 respondents (45 percent) with a one-way commute of more than 20 miles indicated they use alternative routes on a daily or weekly basis.

Respondents from age 40 to 60 were the most likely to use alternative routes (55 percent on a daily or weekly basis), while respondents of over age 60 were the least likely (20 percent on a daily or weekly basis). About 41 percent of respondents under age 40 use alternative routes on a daily or weekly basis.

About 28 percent of female respondents use alternative routes on a daily or weekly basis, as compared to 49 percent of male respondents.

G8. Commute Time.

Commute Time, One-Way (in minutes)	Count	Percent
Less than 10	12	7%
11 to 20	30	18%
21 to 30	36	21%
31 to 40	22	13%
41 to 50	20	12%
51 to 60	13	8%
Over 60	17	10%
Work at home	12	7%
Varies	6	4%
Total	**168**	**100%**

Exclusions: 3 respondents did not know or did not provide their average commute time.

About 25 percent of respondents have a one-way commute time of 20 minutes or less, while about 30 percent of respondents have a one-way commute of more than 40 minutes. There were minor discrepancies in the number of respondents who answered "work at home" or "varies greatly because of various job sites", as compared to the responses to G6.

There was a strong relationship between the commute distance and the average commute time indicated by the respondents:

- 16 of the 79 respondents (20 percent) with a one-way commute of 20 miles or less stated an average commute time of more than 30 minutes;
- 54 of the 68 respondents (79 percent) with a one-way commute of more than 20 miles stated an average commute time of more than 30 minutes.

(Four blank or inconsistent responses were eliminated from the calculations in the previous two bullets, such as those who responded to one question but not the other.)

As with commute distance, respondents from age 40 to 60 were the most likely to have very long commute times of more than 60 minutes (15 percent, as compared to 6 percent for the other age groups).

Commute times varied slightly by gender. About 35 percent of female respondents have a one-way commute time of 40 minutes or more, as compared to about 28 percent of male respondents.

G9. Schedule Flexibility.

Schedule Flexibility	Count	Percent
No flexibility	31	18%
Not more than 15 min	36	21%
Not more than 30 min	20	12%
Not more than 45 min	8	5%
Not more than 1 hour	17	10%
Free to adjust as needed	56	33%
Total	**168**	**100%**

Exclusions: 3 respondents did not provide their schedule flexibility.

While about 33 percent of respondents are free to adjust their work/school schedules as needed, about 18 percent of respondents are not at all flexible with their schedules. The other 48 percent have schedule flexibility of 1 hour or less.

Younger respondents were somewhat less likely to have schedule flexibility than older respondents. About 57 percent of respondents under age 40 had thirty minutes of schedule flexibility or less (including those with no schedule flexibility), as compared to 48 percent of those who were age 40 or older.

About 68 percent of female respondents had thirty minutes of schedule flexibility or less, as compared to 48 percent of male respondents.

G10. First Found Out About TravelTIP.

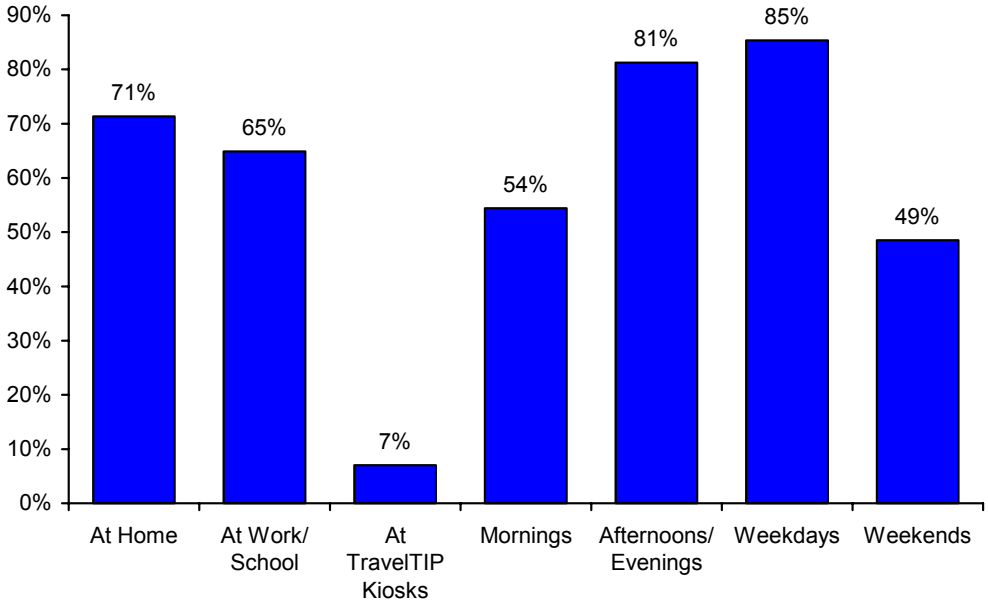
Found Out About TravelTIP	Count	Percent
Newspaper or magazine ad	88	51%
TV or radio commercial	26	15%
Internet search	16	9%
Word of mouth	14	8%
Poster, sign, or billboard	3	2%
Other	24	14%
Total	**171**	**100%**

Many respondents found out about TravelTIP from a newspaper or magazine ad. The second most common means was a TV or radio commercial. "Other" responses included a news program/article, through work, or from other websites (ocnow.com, octa.net).

About 56 percent of respondents of age 40 or over found out about TravelTIP from a newspaper or magazine ad, as compared to 44 percent of respondents under age 40.

About 74 percent of male respondents found out about TravelTIP from a newspaper ad, magazine ad, or TV/radio commercial, as compared to 42 percent of female respondents. By contrast, about 34 percent of female respondents found out about TravelTIP by Internet search or word of mouth, as compared to just 12 percent of male respondents.

G11. Typical Use of TravelTIP.



The most typical uses of TravelTIP were at home (71 percent), in the afternoons/evenings (81 percent), and on the weekdays (85 percent).

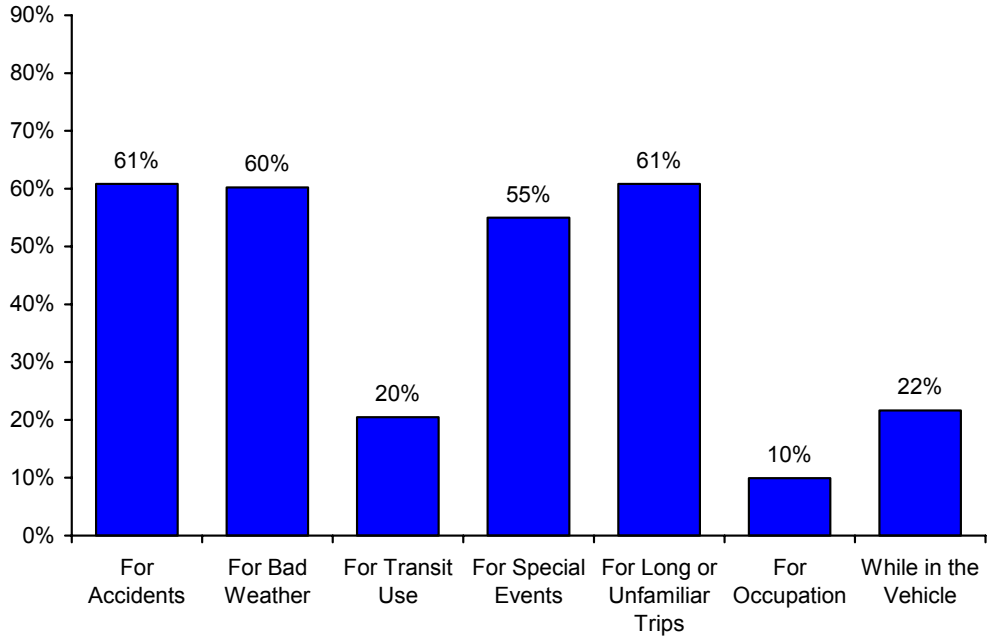
An appreciable percentage of respondents also typically use TravelTIP at work/school (65 percent), in the mornings (54 percent), and on the weekends (49 percent).

Few respondents typically use TravelTIP at a TravelTIP kiosk (7 percent).

Note that:

- 36 percent of respondents typically use TravelTIP at both home and at work/school. 35 percent use it only at home, and 29 percent use it only at work/school.
- 35 percent of respondents typically use TravelTIP both in the mornings and in the afternoons/evenings. 19 percent use it in the morning only, while 46 percent only use it in the afternoon/evening.
- 34 percent of respondents typically use TravelTIP both on the weekdays and on the weekends. 51 percent use it only on weekdays, while 15 percent use it only on weekends.

G11. Typical Use of TravelTIP. (cont.)



Many respondents typically use TravelTIP:

For Accidents: when hearing about a traffic accident on the roadway (61 percent);

For Bad Weather: when there was severe weather (60 percent);

For Special Events: such as sporting events or concerts (55 percent);

For Long or Unfamiliar Trips (61 percent).

Fewer respondents typically use TravelTIP:

- For Transit Use: when considering transit for a particular trip (20 percent);
- For Occupation: as part of their job as a taxi driver, delivery person, or fleet dispatcher (10 percent);
- While in the Vehicle: by calling 949-451-1TIP (22 percent).

G12. TravelTIP Information Used.

Traffic	Transit	Count	Percent
No	Yes	1	1%
Yes	No	130	76%
Yes	Yes	39	23%
Total		**170**	**100%**

Exclusions: 1 respondent checked no for both boxes.

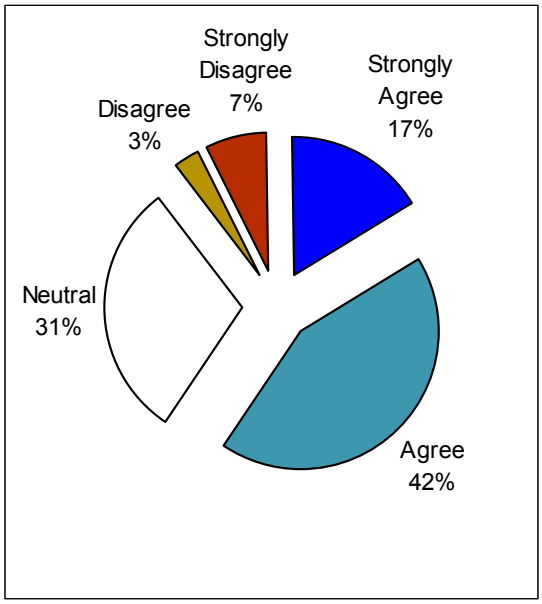
Most respondents (76 percent) use TravelTIP for traffic information only. Thirty-nine respondents (23 percent) use TravelTIP for both traffic and transit information, while only one person uses TravelTIP for transit information only.

Survey Findings – Traffic (total of 168 respondents)

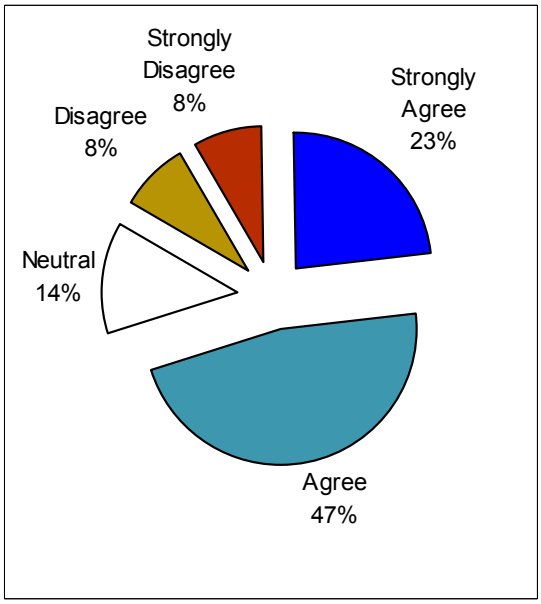
The first two questions of this section asked patrons how strongly they agreed or disagreed with the statements provided.

TF1. TravelTIP makes my travels easier.
TF2. TravelTIP is a convenient source of traffic information.

TF1: Makes Travel Easier



TF2: Convenient



Exclusions: 1 respondent did not answer TF1.

TF1: Most respondents have a favorable opinion of TravelTIP as a tool to help make their travels easier. About 59 percent of respondents either agreed or strongly agreed with the statement, while 10 percent disagreed or strongly disagreed.

Responses did not vary significantly by distance traveled. About 55 percent of those with a one-way commute of 20 miles or less either agreed or strongly agreed, as compared to 63 percent of those with a one-way commute of more than 20 miles.

Similarly, responses did not vary significantly by age, gender, frequency of alternative route use, time traveled, or schedule flexibility.

TF2: Respondents also tended to have a favorable opinion of TravelTIP as a convenient source of traffic information. About 70 percent of respondents either agreed or strongly agreed with the statement, while 16 percent disagreed or strongly disagreed.

TF3. Rate the Usefulness of the following items on TravelTIP's traffic page:

	Freeway Speeds	Freeway Incidents	City Street Speeds	City Street Incidents	Park & Ride Lots	Transit/ Train Facilities	Airports
Very	78 (46%)	84 (50%)	56 (34%)	56 (33%)	17 (10%)	18 (11%)	16 (10%)
Somewhat	52 (31%)	41 (24%)	44 (26%)	43 (26%)	18 (11%)	32 (19%)	27 (16%)
Neutral	15 (9%)	21 (13%)	36 (22%)	39 (23%)	59 (35%)	51 (30%)	49 (30%)
Not Very	8 (5%)	9 (5%)	16 (10%)	15 (9%)	27 (16%)	29 (17%)	27 (16%)
Not at All	15 (9%)	13 (8%)	15 (9%)	15 (9%)	46 (28%)	38 (23%)	46 (28%)
Total Responses	**168 (100%)**	**168 (100%)**	**167 (100%)**	**168 (100%)**	**167 (100%)**	**168 (100%)**	**165 (100%)**

Respondents overall rated TravelTIP's freeway-related information as being the most useful. About 77 percent of respondents found the information on freeway traffic congestion/speeds as being very useful or somewhat useful, while 74 percent found freeway incident information to be very or somewhat useful.

Fewer respondents found arterial-related information to be very or somewhat useful (60 percent for city street traffic congestion/speeds; 59 percent for city street incidents). However, these results may be biased since only one city (Fountain Valley) was providing any arterial information between Jan-Apr 2002.

Other TravelTIP information (i.e., locations of park-and-ride facilities, locations of major transit and train facilities, and locations of major airports) was seen as being less useful overall among the respondents. For each of these questions, between 21 and 30 percent of respondents rated such information as being very useful or somewhat useful.

TF4. Rate the Accuracy of the following items on TravelTIP's traffic page:

	Freeway Speeds	Freeway Incidents	City Street Speeds	City Street Incidents	Park & Ride Lots	Transit/ Train Facilities	Airports
Very	34 (21%)	36 (23%)	20 (13%)	28 (18%)	32 (20%)	38 (24%)	43 (27%)
Somewhat	52 (32%)	51 (32%)	43 (27%)	37 (23%)	25 (16%)	29 (18%)	19 (12%)
Neutral	47 (29%)	49 (31%)	73 (46%)	75 (47%)	81 (51%)	71 (44%)	75 (47%)
Not Very	13 (8%)	9 (6%)	12 (8%)	9 (6%)	6 (4%)	8 (5%)	6 (4%)
Not at All	15 (9%)	15 (9%)	12 (8%)	10 (6%)	15 (9%)	14 (9%)	15 (9%)
Total Responses	**161 (100%)**	**160 (100%)**	**160 (100%)**	**159 (100%)**	**159 (100%)**	**160 (100%)**	**158 (100%)**

The following percentages of respondents rated the accuracy of TravelTIP's traffic page information as being very or somewhat accurate:

- freeway traffic congestion/speeds (53 percent);
- freeway incidents (55 percent);
- city street traffic congestion/speeds (40 percent);
- city street incidents (41 percent);
- locations of park-and-ride facilities (36 percent);
- locations of major transit and train facilities (42 percent);
- locations of major airports (39 percent).

As compared to usefulness:

- a lower percentage of respondents found TravelTIP's freeway or arterial information as being very or somewhat accurate;
- a higher percentage of respondents found TravelTIP's facility location information as being very or somewhat accurate.

TF5. Shown an Incident, Actual.

Shown an Incident	Count	Percent
Yes	70	42%
No	95	58%
Total	**165**	**100%**

Exclusions: 3 respondents did not answer this question.

About 42 percent of TravelTIP's traffic survey respondents indicated that TravelTIP had ever shown them an incident (traffic jam, accident, etc.) that seriously impacted their planned travel route.

TF6. Shown an Incident, False Positive.

False Positive	Count	Percent
Yes	18	11%
No	35	22%
Don't Know	109	67%
Total	**162**	**100%**

Exclusions: 6 respondents did not answer this question.

About 11 percent of survey respondents indicated that TravelTIP had ever shown them an incident on their planned travel route that did not actually exist. About 22 percent answered no, while 67 percent did not know.

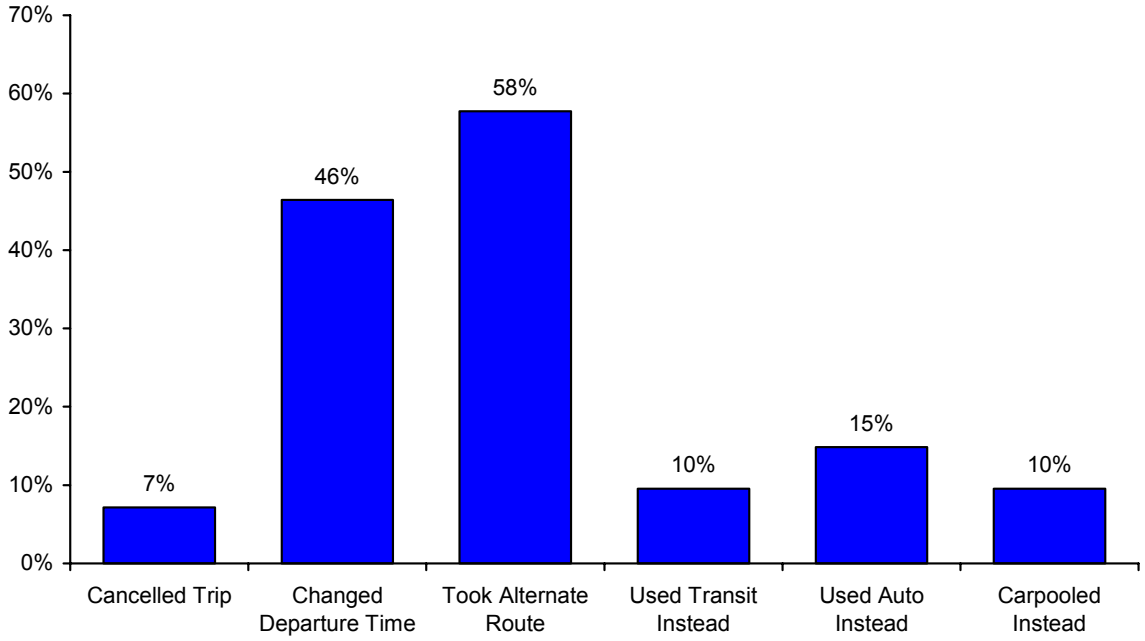
TF7. Not Shown an Incident, False Negative.

False Negative	Count	Percent
Yes	28	17%
No	34	21%
Don't Know	103	62%
Total	**165**	**100%**

Exclusions: 3 respondents did not answer this question.

About 17 percent of survey respondents indicated that TravelTIP had ever failed to show them an incident that seriously impacted their planned travel route. About 21 percent answered no, while 62 percent did not know.

TF8. In Response to TravelTIP Information…



The most common actions that respondents have ever done in response to TravelTIP's traffic information were to:

- take an alternate travel route (58 percent);
- change their travel departure time, by leaving earlier or waiting (46 percent).

A much smaller number of respondents have ever:

- cancelled their trip (7 percent);
- chose to use public transportation when they had originally intended to use an automobile (10 percent);
- chose to drive when they had originally intended to use transit (15 percent);
- carpooled when they had originally intended not to (10 percent).

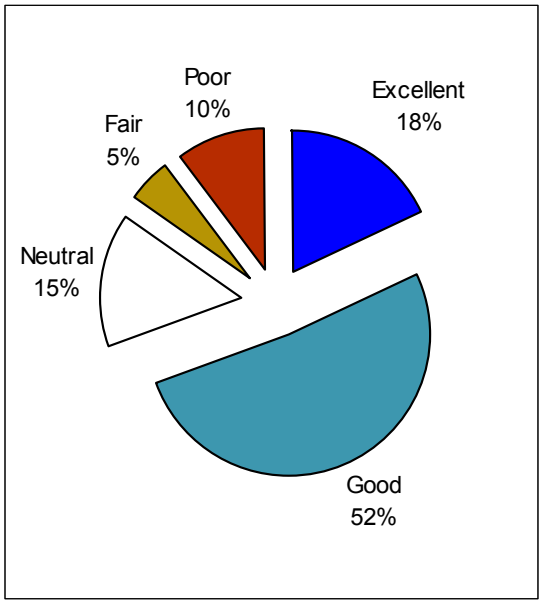
Note that just 37 percent of respondents indicated they had ever made no change and traveled as planned, in response to TravelTIP's traffic information.

Survey Findings – Transit (total of 39 respondents)

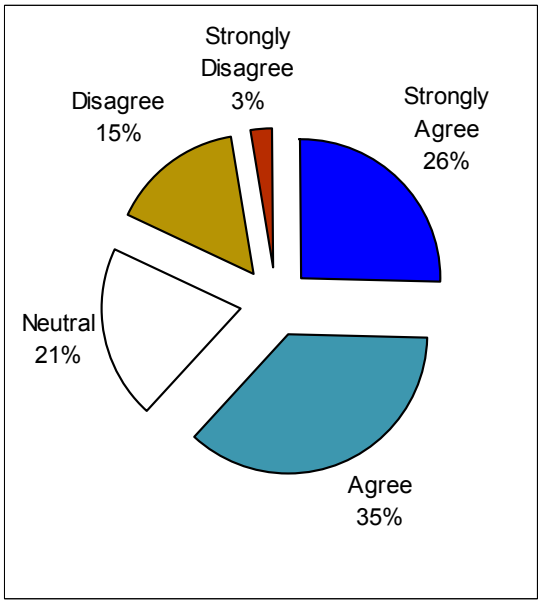
Questions TR2-TR4 of this section asked patrons how strongly they agreed or disagreed with the statements provided.

TR1. How would you rate the usefulness of TravelTIP's transit page overall?
TR2. TravelTIP provides me with transit information that I previously did not have.

TR1: Usefulness



TR2: Provides New Information

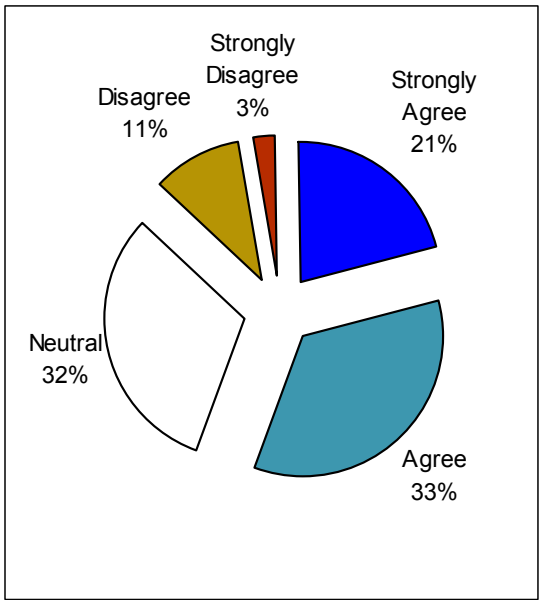


TR1: About 70 percent rated TravelTIP's transit page as either good or excellent, compared to 15 percent who rated it as fair or poor.

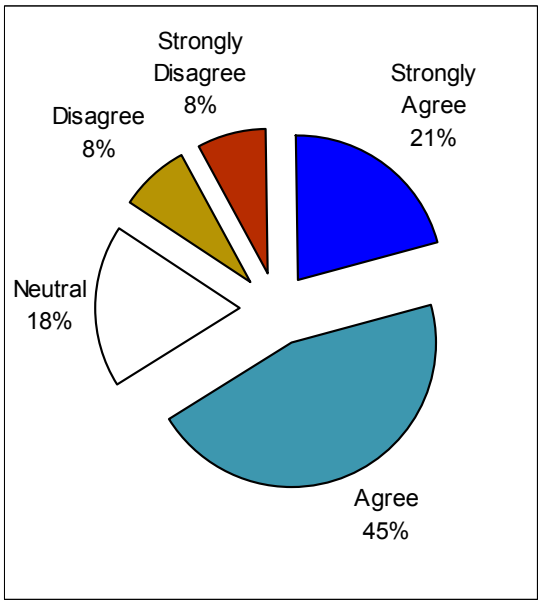
TR2: A majority of respondents (61 percent) agreed or strongly agreed that TravelTIP provides them with new transit information that they previously did not have. About 18 percent disagreed or strongly disagreed with this.

TR3. TravelTIP's transit page makes my travels easier.
TR4. TravelTIP is a convenient source of transit-related information.

TR3: Makes Travel Easier



TR4: Convenient



Exclusions: 1 respondent did not answer TR3.

TR3: About 54 percent of respondents either agreed or strongly agreed with the statement that TravelTIP's transit page makes their travels easier. However, there was less enthusiasm towards this point as compared to the previous two statements.

TR4: Roughly two-thirds of respondents either agreed or strongly agreed that TravelTIP is a convenient source of transit-related information. About 16 percent disagreed.

TR5. Which transit links have you used?

Transit Website Link	Count	Percent
OCTA fare information	20 of 38	53%
OCTA route information	22 of 38	58%
OCTA route maps – North County	23 of 39	59%
OCTA route maps – South County	22 of 37	59%
SCAG TranStar	14 of 37	38%
Greyhound	10 of 36	28%
Los Angeles MTA – bus information	14 of 38	37%
Los Angeles MTA – rail information	15 of 37	41%
Amtrak	22 of 39	56%
MetroLink	19 of 37	51%

More than half of the transit survey respondents have used the website links to OCTA (fares, routes, or maps), Amtrak, or MetroLink. A smaller number have used links to SCAG TranStar, Greyhound, or Los Angeles MTA (bus or rail).

Note that not all of the 39 respondents answered each of the questions in TR5. The percentage indicated in the table is based on the number of respondents to each of the individual questions.

TR6. Suggestions for additional transit links.

Other transit website links that respondents indicated they would like to see added were:

- North County Transit District (NCTD, in northern San Diego County);
- Ground transportation services for Los Angeles International Airport.

User Submitted Comments and Suggestions

This section describes the various comments and suggestions that have been provided by survey respondents since January 2002. Comments were grouped according to the following main issues:

- System performance;
- Download time;
- User interface;
- Functionalities;
- Accuracy.

System Performance: Many comments related to system performance, due to TravelTIP's unreliable and intermittent operation throughout the first half of 2002. The TravelTIP website was unavailable for six weeks during February-March 2002 as server equipment was relocated from National Engineering Technologies (NET) to the local Caltrans TMC. Technical issues with leased services from Verizon and Earthlink DSL have also impacted the availability and operation of the traffic map. The extended outages and intermittent service undoubtedly had a negative impact on the users' perceptions of the site's reliability. Select comments were as follows:

- *"Your web site hasn't worked for me for the past few days. I will wait for traffic update, and nothing will happen. I have tried my Netscape and Explorer with no results. Is there something I'm missing?"*
- *"First time user of site. Clicked on road icon and did not get close up view or more information. Road colors for types of congestion did not show. If these things work I may continue to use site."*
- *"I have tried multiple times to get traffic information, but it never works!"*

Download Time: The traffic map's slow download across 56K modems continues to be an issue. Fifty-three of the respondents (34%) indicated that their Internet connection speed is 56K or less, indicating that there might be a significant number of users impacted by this problem. Additional comments indicated that downloading problems may extend to high-speed internet users as well. Comments included:

- *"The web interface is far too slow. I should be able to tell what I'm looking at without clicking and waiting 6 seconds for every segment of road."*
- *"Download too slow for 56K use; reduces effectiveness/ usefulness of this as a regular tool."*
- *"Quicker page loading times. I have DSL and it is still slow."*

User Interface: A number of suggestions were provided for improving the user interface:

- *"The home page is difficult. There is no indication as to what to do."*
- *"…the format for focusing on specific geographical areas is cumbersome."*
- *"…It is difficult to read and locate. Perhaps a text box would be useful to find the freeway you want."*
- *"…move the freeway signs so that they are visible. The map is too dark."*
- *"It is difficult to see many of the freeway numbers because they are obscured by the green/red lines giving traffic information. The route numbers should be superimposed over the traffic lines so they are visible."*
- *"The site is generally nice, but the icons on the left all look the same. They need to show some distinction so the user can quickly navigate the site."*
- *"I am partly colorblind and the colors for the light & moderate congestion are too close so I can not tell them apart. Can you change the color scheme?"*
- *"Which are the freeways and which ones are the surface streets?"*

Functionalities: Of the comments submitted regarding TravelTIP's functionalities, many of them indicated it would be beneficial to add weather information and video images to the website. Other comments suggested that the coverage area should be enlarged. Some of the comments included:

- *"Signals out in an area would help. Weather conditions are always helpful. Temporary closures are most helpful."*
- *"I would like to see live web cams of the traffic."*
- *"Camera images, toll road charges. Which lanes are blocked."*
- *"Extend the area into Riverside County. At least to the I-15 interchange."*
- *"The whole northwest corner of the county is not covered and until then the system cannot fulfill my needs."*
- *"It would be nice if a few more speed ranges would be shown."*
- *"Real time bus or train status, camera images, weather."*
- *"It would be useful to have information about work done by Caltrans."*

Accuracy: A few comments were submitted regarding the accuracy of the TravelTIP information:

- *"The map is not accurate on the 55 freeway; it mostly shows green when traffic is congested, especially at rush hours."*
- *"Accidents broadcast on radio do not show up on the map. Sig alerts also…I think you need to be more current on this information."*
- *"Traffic speeds are incorrect."*

Appendix E – Information on Traveler Information Website Usage in California

This report provides information regarding the volume of usage for three advanced traveler information system (ATIS) websites in California: TravelTIP, Smart Traveler, and CHIN. Usage volume for each site is computed from automatically collected server statistics and is based on number of pages requested. These statistics do not necessarily indicate the number of unique users or the number of distinct user sessions. For example, TravelTIP's traffic page (described below) refreshes automatically approximately every 60 seconds, and each refreshed page is counted as a new page request or "hit." A single user that leaves the TravelTIP traffic page on his web browser for, say, 30 minutes would generate roughly 30 page requests in the statistics. Smart Traveler and CHIN do not refresh automatically, so their counts are more indicative of distinct user sessions.

TravelTIP

The TravelTIP traveler information website (www.traveltip.net) provides users with traffic and transit information for the Orange County area.

Traffic – TravelTIP's Traffic page, illustrated in Exhibit 1, contains a color-coded traffic speed and flow map (for both freeways and arterials), incident listings, and the locations of major transportation facilities. Users can zoom into particular portions of the map, as well as click on particular roadways for more specific traffic information (i.e., average travel speed and estimated segment-level travel times). Users can also display locations of park-and-ride lots, airports, train stations, and transit centers on the map.

Exhibit 32 – TravelTIP Traffic Page

Transit – The Transit page, shown in Exhibit 2, provides an organized list of hotlinks to the websites of transit providers throughout Orange County and Los Angeles County. These websites generally contain transit route maps, transit schedules, and transit fares, as well as trip planning tools.

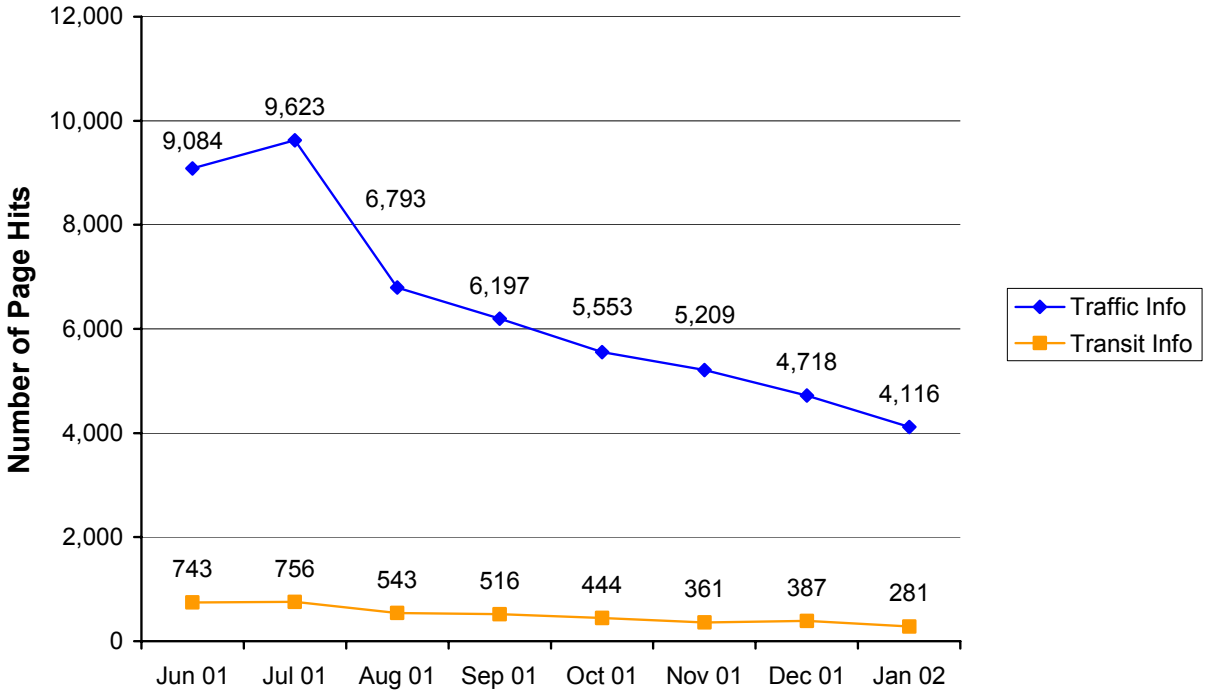
Exhibit 2 – TravelTIP Transit Page

The initial version of the TravelTIP site also had an "Other" page, which provided information about bikeways and other alternative modes of transportation. The website design was changed after its initial release, and the Other page has been dropped.

TravelTIP went into operation in September 2001 as a "beta" version, and a formal "media blitz" was held on June 11, 2001 to present the system to about 80 members of the media (reporters from local TV & newspapers and trade journals).

Web server statistics, developed on a monthly basis, are available for June 2001 through January 2002. Exhibit 3 shows the total estimated number of page hits to the traffic page and transit page, by month.

Exhibit 3 – TravelTIP Usage, by Month



July 2001 page hits are estimates based on available data.

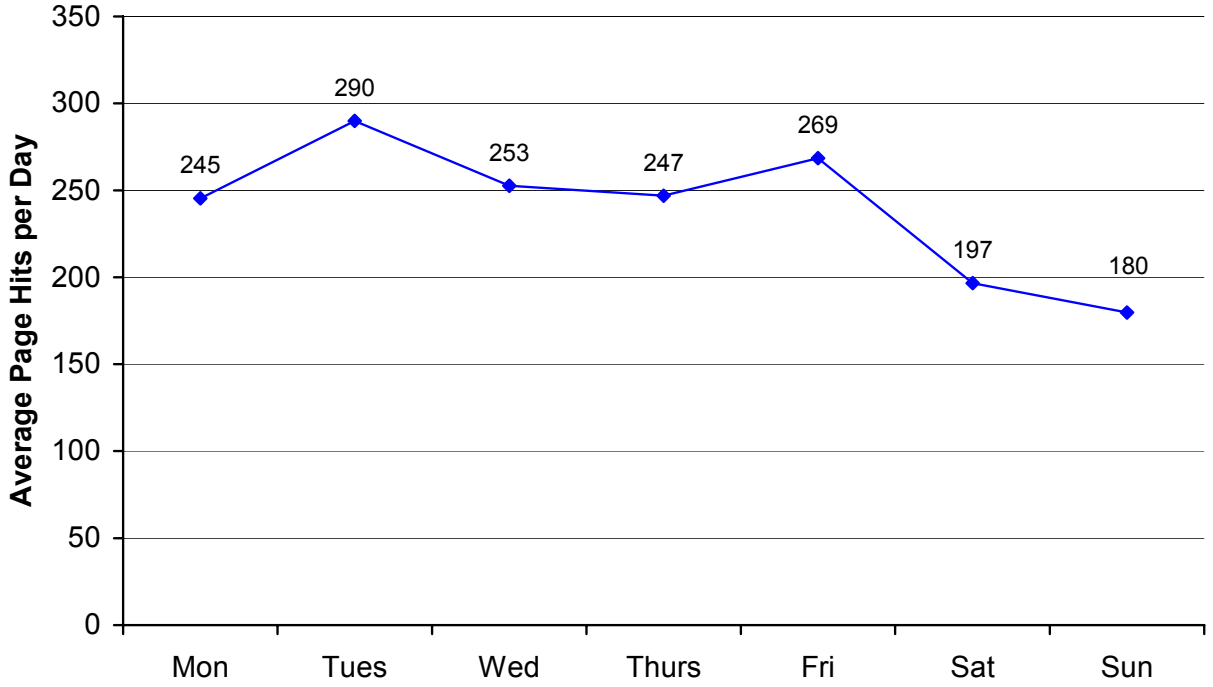
The average hits-per-month to the Traffic page was 6,412 during the eight-month period; the average hits-per-month to the Transit page was 504. The ratio of Traffic page hits to Transit page hits was roughly 12.7 to 1.

Note that the June 2001 numbers reflect only 15 days of data, starting from June 11 (data for June 17 and June 27-30 were not available for this report).

The average number of TravelTIP page hits per day, including both the traffic and transit pages, was much higher in June and July (daily average of 439) than in the later six months (daily average of 191). In particular, the number of page hits on June 12 (i.e., the day after the media blitz) is estimated at 1,194 – almost five times higher than the overall average daily number of page hits of 241 during the eight-month period.

Exhibit 4 shows the average daily number of page hits, by day of week.

Exhibit 4 – TravelTIP Usage, by Day of Week



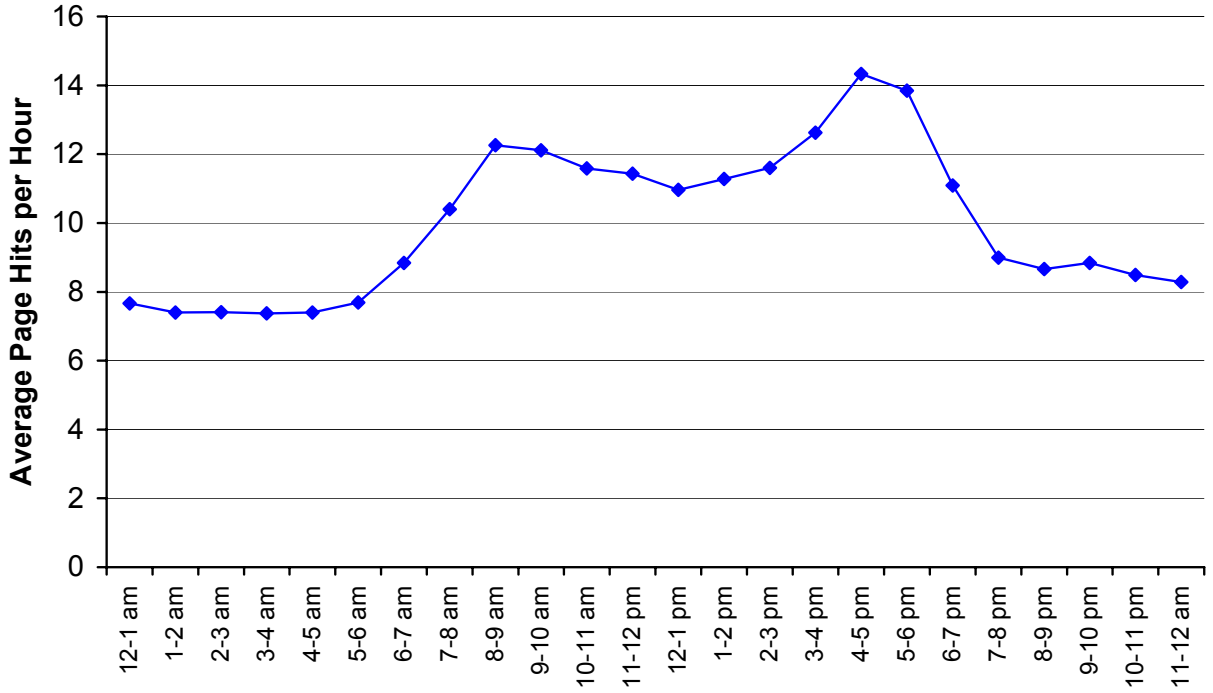
The relative proportions of Traffic page hits versus Transit page hits by day of week were not available.

The day of the week with the highest average usage was Tuesday, followed by Friday. However, it should be noted that June 12, the day after the media blitz, was on a Tuesday. If data for this particular day is removed from the calculation, the average daily number of page hits on Tuesdays was 263 – closer to the average for other weekdays.

The volume of page hits on Mondays through Fridays (average of 261 page hits per day) was about 38.5% higher than the volume on Saturdays and Sundays (average of 188 page hits per day).

Exhibit 5 shows the average hourly number of page hits, by time of day.

Exhibit 5 – TravelTIP Usage, by Time of Day



The relative proportions of Traffic page hits versus Transit page hits by time of day were not available. Different time of day distribution data by day of week was also not available.

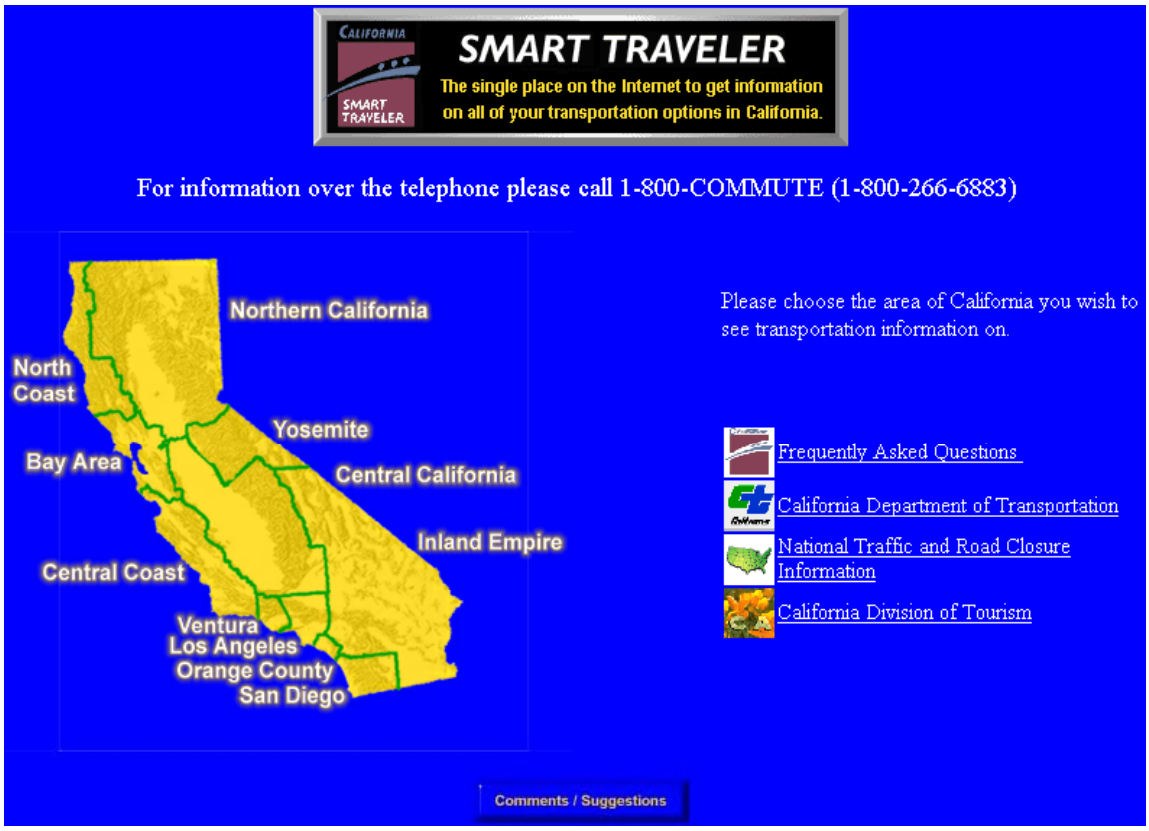
The peak times were from 8 am to 10 am in the mornings (average of 12.2 page hits per hour), and from 3 pm to 6 pm in the afternoons (average of 13.6 page hits per hour). Usage was fairly constant from 10 am to 3 pm (average of 11.4 page hits per hour).

Usage of the TravelTIP HAT phone number (949-451-1TIP), which provides information that is similar to the website, was about 900 calls per month. More detailed data for usage of this phone number is not available at this time.

Smart Traveler

The Smart Traveler website, maintained by the Caltrans Operations Program, is primarily a portal to other regional traveler information services and can be accessed at www.smart-traveler.com or http://caltrans511.dot.ca.gov (as well as by phone). The home page is shown in Exhibit 6.

Exhibit 6 – Smart Traveler Home Page



The user selects a particular region of interest, which takes the user to a regional web page. This is shown in Exhibit 7, for the Orange County region.

Exhibit 7 – Smart Traveler Regional Page (Orange County)

The user then selects a particular transportation mode of interest. The number of modes listed varies by region, and may include the following: highway, rideshare, Park & Ride, bus (or transit), rail, Amtrak, airport, ferry, bicycle, telework, tourist, vacations, air quality, and additional information.

By clicking on a modal link, the user is then directed to a webpage with links to various regional transportation information websites. For the Orange County region, some of these links include TravelTIP, The Toll Roads (www.tollroad.com), Traffic Assist (www.trafficassist.com), MapQuest (www.mapquest.com), Maps On Us (www.mapsonus.com), the SCAG TranStar transit route page (www.scag.ca.gov/transit), Greyhound (www.greyhound.com), Amtrak West (www.amtrakwest.com), MetroLink (www.metrolinktrains.com), Southern California Rideshare (www.socalcommute.org), and the California Bicycle Coalition (www.jps.net/cbc).

The average monthly page hits to the Smart Traveler regional sites is shown below, in Exhibit 8.

Exhibit 8 – Smart Traveler Average Monthly Page Hits

Region	Number of Hits	Percent of Total
Bay Area	545	21.9%
Northern California	486	19.5%
Inland Empire	436	17.5%
Los Angeles	421	16.9%
Central Valley	186	7.5%
Central Coast	175	7.0%
Orange County	163	6.5%
North Coast	81	3.2%
Total	**2,493**	**100%**

Note: Links for the Yosemite, Ventura, and San Diego regions take the user directly to a website controlled by another server. For this reason, average monthly page hits for those websites are not available.

The Smart Traveler phone number (1-800-COMMUTE) provides information that is similar to the website. Usage of this phone number from June 2001 to January 2002 is shown in Exhibit 9.

Exhibit 9 – Usage of Smart Traveler Phone Number

Month	Number of Calls
June 2001	207,895
July 2001	192,221
August 2001	199,278
September 2001	180,996
October 2001	198,243
November 2001	179,234
December 2001	169,208
January 2002	204,187
Monthly Average	**191,408**

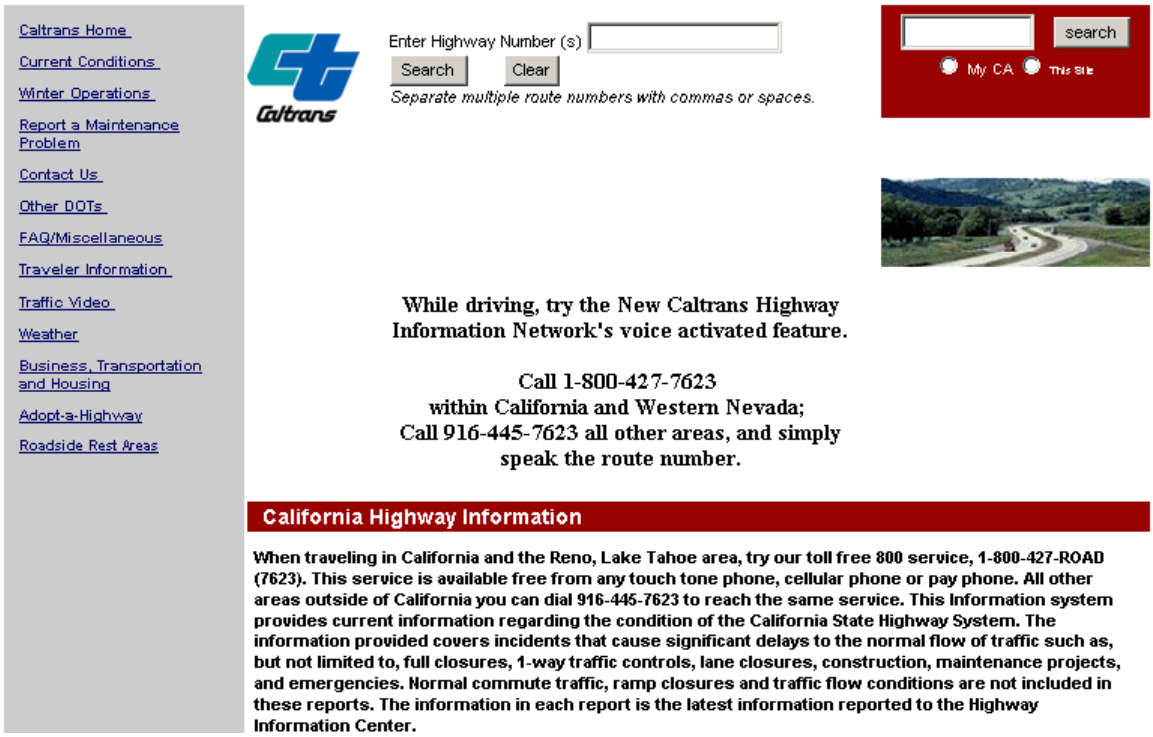
The Smart Traveler phone number is in operation in three regions: greater Los Angeles (SCAG region), San Diego (SANDAG region), and Sacramento (SACOG region). During the eight-month period:

- Calls in the greater Los Angeles region comprised about 90.6% of the total call volume;
- Calls in the San Diego region comprised about 9.0% of the total;
- Calls in the Sacramento region comprised about 0.4% of the total.

CHIN

The California Highway Information Network (CHIN) website is located at http://www.dot.ca.gov/hq/roadinfo/. The home page is displayed in Exhibit 10.

Exhibit 10 – CHIN Home Page



The CHIN website provides information on the California State Highway System. This information consists of a list of incidents that cause significant delays to normal traffic flows, such as full closures, one-way traffic controls, lane closures, construction projects, maintenance projects, and emergencies. Normal commute traffic, ramp closures, and traffic flow conditions are not included.

Each district of Caltrans provides information for routes within its jurisdiction. An example of this route-level information is shown in Exhibit 11.

Exhibit 11 – CHIN Route Information Page

California Highway Information

This highway information is the latest reported as of Wednesday, August 14, 2002 at 16:37 .

Slow for the Cone Zone

I 5

[SAN DIEGO & IMPERIAL CO'S]
NO TRAFFIC RESTRICTIONS ARE REPORTED FOR THIS AREA.

[ORANGE CO]
NO TRAFFIC RESTRICTIONS ARE REPORTED FOR THIS AREA.

[LOS ANGELES & VENTURA CO'S]
NO TRAFFIC RESTRICTIONS ARE REPORTED FOR THIS AREA.

[SOUTH CENTRAL CALIFORNIA]
NO TRAFFIC RESTRICTIONS ARE REPORTED FOR THIS AREA.

[CENTRAL CALIFORNIA]
THE NORTHBOUND CONNECTOR TO EASTBOUND SR 120 (SAN JOAQUIN CO) IS CLOSED FROM 2200 HRS EACH NIGHT TO 0600 HRS EACH MORNING THRU 8/16/02 - DUE TO CONSTRUCTION - A DETOUR IS AVAILABLE

[NORTH CENTRAL CALIFORNIA]
NO TRAFFIC RESTRICTIONS ARE REPORTED FOR THIS AREA.

[NORTHERN CALIFORNIA]
IS CLOSED TO NORTHBOUND TRAFFIC FROM 2.6 MI NORTH TO 5.8 MI NORTH OF THE SHASTA/SISKIYOU CO LINE 24 HRS A DAY 7 DAYS A WEEK THRU 10/31/02 - DUE TO CONSTRUCTION - A DETOUR IS AVAILABLE

The CHIN website also contains area maps of the state highway system, links to images from live traffic cameras throughout the state, links to current speed sensor data in three regions (Los Angeles, San Francisco, and San Diego), a list of rest areas with locations, and more specialized information pertaining to mountain highways and weather conditions. CHIN also allows users to submit a maintenance service request during weekday business hours (i.e., broken guardrail, downed sign, graffiti, litter, pothole).

In addition, the CHIN website offers links to other websites, including those pertaining to the state government, the U.S. government, national road closure information (via the Federal Highway Administration), and other transportation agencies.

The estimated number of hits to the CHIN homepage, from June 2001 to January 2002, is provided in Exhibit 12.

Exhibit 12 – Estimated Hits to CHIN Home Page

Month	Number of Hits
June 2001	55,869
July 2001	56,787
August 2001	90,550
September 2001	58,298
October 2001	56,113
November 2001	158,011
December 2001	330,963
January 2002	180,507
Monthly Average	**123,387**

The CHIN phone number (1-800-427-7623) provides information that is similar to the website. Usage of this phone number from June 2001 to January 2002 is shown in Exhibit 13.

Exhibit 13 – Usage of CHIN Phone Number

Month	Number of Calls
June 2001	69,870
July 2001	56,711
August 2001	149,405
September 2001	60,073
October 2001	54,315
November 2001	420,042
December 2001	769,661
January 2002	463,575
Monthly Average	**255,457**

Usage of both the CHIN website and phone number varies significantly from month to month. This is likely to be caused by monthly variations in weather conditions and the level of construction & maintenance activity on the state highway system.

Summary

Exhibit 14 compares the average daily use of the TravelTIP website and phone number to that of Smart Traveler and CHIN, during the eight-month period from June 2001 to January 2002.

Exhibit 14 – Summary Comparison

System	Average Daily Website Hits (Home Page)	Average Daily Number of Calls
TravelTIP	241	30
Smart Traveler	81	6,250
CHIN	4,029	8,341

Exhibit 14 does not highlight that use of the TravelTIP website went down significantly after July 2001:

- From June 2001 to July 2001, there were an estimated 439 average daily home page hits to the TravelTIP website;
- From August 2001 to January 2002, this number went down to 191.

CHIN is clearly the most heavily used of the three systems. Reasons for variations in use among the three systems are likely to include marketing, system functionalities, and geographic coverage. For example, TravelTIP focuses on the Orange County region, while both Smart Traveler and CHIN have a statewide focus.

Endnotes/References

[1] ISTEA requires that "operational tests utilizing federal funds have a written evaluation of the Intelligent Vehicle Highway Systems technologies investigated and the results of the investigation." Although Showcase is not officially an operational test, it deploys and demonstrates ITS services, functions, and technologies under "real world" conditions, similar to an operational test.
[2] California Statistical Abstract, Table B-4. California Department of Finance, Sacramento, CA. October 2001.
[3] California Statistical Abstract, Table J-4. California Department of Finance, Sacramento, CA. October 2001.
[4] United States Environmental Protection Agency, Office of Mobile Sources, AP-42, Air Pollutant Emissions Factors, Tables 1.08-1.21, 1998.